DIET IN HEALTH AND DISEASE

THE PRACTITIONER HANDBOOKS

Edited by SIR HUMPHRY ROLLESTON, Bt., G.C.V.O., K.C.B. M.D., F.R.C.P., and ALAN A. MONCRIEFF, M.D., F.R.C.P.

I. FAVOURITE PRESCRIPTIONS

II. PRACTICAL PROCEDURES

III. MODERN ANÆSTHETIC PRACTICE

IV. DIET IN HEALTH AND DISEASE

V. MODERN DIAGNOSIS

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PREFACE

THE importance of nutrition is being increasingly recognized, and among the whole population, lay and medical, there appears to be a growing interest in the details of diet. In the medical schools and in the hospitals of this country, the science of dietetics is receiving more and more attention so that the practitioner of the future will probably be able to acquire more expert knowledge of this subject in his training than has been possible for many of his present-day predecessors. It was with the object of helping the practitioner of to-day that the series of articles which form the basis of this book was first planned. The experts who have collaborated have set out their specialized knowledge in a practical manner with detailed menus and diet sheets in a form which can be readily copied and adapted for the special circumstances of the individual patient. Most of the chapters have already appeared in some form in the columns of *The Practitioner*, but for the purposes of this book each author has carried out special revision so that much original material now appears for the first time. Particular attention is drawn to the table of the vitamin and mineral content of foods on pages 28 and 29, which Prof. V. H. Mottram specially prepared to summarize modern views on this important aspect of food. The particular problems of childhood have been dealt with in a series of chapters including a summary of the normal management of breast feeding and artificial feeding. Dr. C. Hoyle's contribution on alcohol is a much modified version of his article in a special number on the use and abuse of drugs and preparations which appeared in April 1937. Miss E. M. Widdowson

and Mrs. A. B. Callow have epitomized the subject of the effects of cooking in a brief concluding chapter specially written for this book. The editors willingly take this opportunity of thanking all the contributors for their careful collaboration and the co-operative manner in which they have responded to editorial suggestions for improving the dove-tailing and avoidance of overlapping so necessary in a composite publication of this nature. Prof. E. P. Cathcart in his thought-provoking introduction shows how the science of dietetics has a great part to play in the fitness of the nation, The general practitioner is in an important position in this respect: if this book helps him in his difficulties it will serve its purpose as a direct contribution to the campaign for improving the national health.

CONTENTS

CONTENTS—*continued*

CONTENTS—*continued*

INTRODUCTION

BY E. P. CATHCART, C.B.E., M.D., D.Sc., LL.D., F.R.S.

The publication of this series of articles on diet, in book form, is to be highly commended. I think it is true to say that there is no subject we are more familiar with than food and, at the same time, I doubt if there is any everyday subject about which the average medical practitioner has so little expert knowledge. Yet the problem of food in relation to many of his patients is constantly before him. He has the many individuals who suffer to greater or lesser extent from indigestion, which may or may not be due to faulty food habits; he has those who habitually over-eat; he has those who rightly wish to reduce their body weight as well as those whose only desire is to slim; he has those who refuse to eat; he has those who suffer from food fads and he has those who are definitely true convalescents and are capricious about their diet. He has indeed to deal with a perfect medley of dietetics, self abuse and neurosis. The average practitioner has to rely largely on his own experience of trial and error. He takes, and must take, a great deal for granted. He is aware that the diet he prescribes must fulfil certain physiological principles; that it must contain a sufficiency of energy; that it must contain a certain amount of protein; that except in particular instances it must contain fat and carbohydrate along with an appropriate supply of mineral salts and vitamins. But he is, as a rule, not quite certain how much of these various materials should be present. In a nation not notorious for being

"cuisine-minded," he has perhaps tended to underrate the value of dietetics as a therapeutic measure. As in the past, at least, but few medical schools devoted much attention to the subject of dietetics he had little opportunity for adopting any other attitude. Indeed, if the average practitioner were pressed to say why he advised this or that regimen, apart from the dietetic treatment of conditions like diabetes and perhaps obesity, he would be hard put to it to justify his recommendation.

The young practitioner, who has not yet gained his practical experience, called in to see a case may remember that his textbooks stated that for such a patient a light diet was indicated. He no doubt remembers something about the light diets given to patients in his hospital, but he has little or no knowledge regarding the range of light diets and especially their economic aspect. He naturally suggests that the patient be kept on a light diet and hopes devoutly that he will be over the threshold of the home before he is questioned as to what exactly the patient is to get. It is indeed a matter for congratulation that the editors of this interesting and valuable series have seen fit to include a general article on sick-room menus and recipes. Attention may also be directed to the article on the general effects of cooking. It is one thing to prescribe a certain regimen, even when it is founded on the most secure physiological basis, but it is quite another problem to get the patient to follow it and thrive on it. So much depends on the art and skill of presentation. The capacity of the various household kitchens, and it is sometimes forgotten that the cooking has to be done with the relatively limited equipment of household kitchens, and not in the specially equipped institutional kitchens, is just as variable as the family purse which has to provide the material. As Andrew Boorde remarked four hundred years ago in his Dyetary of Health,

"God may send a man good meat but the devil a bad cook to spoil it."

Moreover the art of presentation of the diet, not merely of the actual food, but the actual layout of the meal, plays a part in the stimulation of that subtle factor, appetite, which always lies in the background and has to be faced soon or later. Frequently, in the anxious effort to stress the exact composition and constitution of the correct food to be given to the patient, the immediate response of the patient to the food provided is apt to be lost sight of. The classical experiments of Pavlov on psychic secretion, as it has been called, proved in the most certain fashion that there is a most intimate connexion between the desire for food and the secretion of the digestive juices. It has, however, it must be admitted, also been shown that in the case of the human being who has been induced to consume most nauseous edible materials, although digestion may be delayed, it is accomplished in the end. But even more important than the provision of appetizing food is the emotional state of the individual. There is no doubt that food consumed in happy surroundings is better and more rapidly digested than when there is, for instance, a state of fear, of anger or hatred. The psychological environment in the broadest sense of the term is a most potent factor in the proper utilization of food.

There is a tendency to-day to belittle the significance of appetite as an index of somatic needs, to regard it, in the main, as associated with mere sensual satisfaction of the palate, which, admittedly, it often is. Yet those who adhere to such a view are prepared to accept the sensations of both hunger and thirst as definitely indicative of bodily needs and treat their satisfaction as a perfectly normal act. Pathological picas are well recognized; is it not possible that sometimes at least appetite gives evidence of a physiological pica, an indica-

tion of the need for correction of some somatic imbalance? Whatever be its nature appetite is a subtle and capricious complex which should receive appropriate attention.

One of the primary criteria of a really good diet, especially if it has to be carried on for a considerable period of time, is that it should arouse the desire to eat, if that be in abeyance. As in nursing we must depend on the nurse provided, so in the case of dieting we are for the most part in the hands of the cook who is available. How often the practitioner has yearned, if only for a brief period, for the services of one of these very rare

> " Epicurean cooks
> (who) Sharpen with cloyless sauce his appetite."

If the practice of dietetics consisted only in the ordering of this or that regimen, provided the cooking was adequate, the problems to be solved would be easy, but, unfortunately for himself, the medical practitioner has not to deal with a mere mausoleum for his viands but with a human being, with all his likes and dislikes, with often his own ideas, frequently foolish no doubt, about what he can and cannot eat. It is not sufficient merely to think of the food to be supplied; the particular patient must never be left out of the picture.

As a physiologist, who is intensely interested in the problems of food and nutrition, I am always sorry for the clinician who tries, in the best scientific manner, to translate academic research work, carried out, unfortunately, for the most part on the lower animals, with different metabolic rates and life spans, into terms of practical bedside dietetics. Many, even of those who are particularly interested in food and nutrition, seem to forget that the whole science is still young and the bases not yet well established. As Burnet and Aykroyd state in their interesting report published by the Health Section of the League of Nations:

"There is a science of nutrition which is the necessary basis of all practical action. But it cannot be said that fundamental principles are in this field as firmly established as, let us say, the principles which underlie the science of engineering. Many 'generally accepted' facts are, in reality, debatable; 'laws' which seemed fully established twenty years ago are open to question. In the absence of certainty on many points it is necessary to make shift with probability."

If this be so, and I personally believe it to be a true statement regarding the present position of knowledge, except that I should substitute *possibility* for *probability* at the end of the quotation, it is not to be wondered at that a great deal of dietetics must be empirical, that the advice given and the line of treatment recommended are the fruit of long experience and not of laboratory origin. Much of this fruit, although the prescriber may be quite unable to give scientific chapter and verse as proof for his belief, is of real value. So long as the patient benefits, the scientific justification can wait. It will, no doubt, eventually be forthcoming.

A common fallacy, implied perhaps more than it is practised, is that the patient should receive each and every day a diet adequate to meet all possible needs. I think a good case can be made out to justify, from time to time, quite considerable variation in the daily food intake, an alteration, let us say, of a full, a frugal, and a moderate diet. No one, except in the most exceptional of circumstances, would advocate keeping an individual in a room of relatively high uniform temperature. Change and variety, generally speaking, are physiologically sound.

CHAPTER I

PRACTICAL DIETETICS

By V. H. MOTTRAM, M.A.

THE APPROACH TO DIETETICS

A WELL-KNOWN labour leader complained recently that technical experts on dietetics talk in terms of calories, vitamins and proteins, which mean nothing to the layman. He pleaded for the translation of these terms into a more intelligible language. Many will agree with this complaint and second his plea, for even the dietitian himself welcomes a simplification of the terminology which has grown up round that subject. What is needed is a more rapid shorthand way of resuming the modern knowledge of dietetics than an enumeration and evaluation of the amounts of calories, proteins, fats, carbohydrates, mineral matter and vitamins which have been shown to be important if not absolutely essential in human nutrition.

Such simplified statement can be most easily obtained by altering the approach to dietetics. The discussion of the nature and occurrence of the various essentials in diet can be dropped and an inquiry made as to what are the functions of food—what foods do in the body, for what purposes foods are taken. Instead of a chemical approach, which is of necessity technical and complicated, a biological or physiological approach, may be adopted. In this way it will be asked not what foods *are* but what they *do*. The answer is fortunately much more comprehensible and memorizable both

to the layman and even the practical dietitian. The two methods of approach are here set out.

(i) *The chemical approach.*—The chemist thinks of a food as being made up of, or containing, proteins of differing qualities, fats, carbohydrates, calcium, phosphorus, iron, iodine, sodium, potassium, magnesium, copper, and vitamin A, B_1 and B_2,* C (or ascorbic acid), D and possibly E. Taught perhaps by those who make the large bowel the bogy man of hygiene they may search for roughage as fibre in the food and by the gourmets for extractives. All these are capable of a high degree of estimation, with the exception of the vitamins, and even here, with five of them a fair degree of accuracy may be obtained.

(ii) *The physiological approach.*—The physiologist thinks of the functions of food as being (*a*) energy- and heat-producing; (*b*) body building; and (*c*) protecting.

Thus—

Fats and carbohydrates	are	predominantly	energy-producing	materials.
Proteins	,,	,,	body-building	,,
Inorganic elements and vitamins	,,	,,	body-protecting	,,

It may frankly be admitted that the parallelism is by no means exact. Proteins can be and are largely used as energy-producing materials, whilst derivatives of fats and carbohydrates enter into the structure of the body and so these may be called body-building. Calcium and phosphorus enter into the structure of the bones and teeth in large amounts, and so can (and should) be called body-builders, and proteins in giving rise to hormones in the body might be termed body-protectors.

None the less the vaguer and more inexact terminology of the physiologist is more understandable and more useful than

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*B_2 is a complex and contains ribo-flavin and nicotinic acid or nicotinamide.

that of the chemist. It leads somewhere. As will be shown later the physiologist's line of approach gives a much better view-point of a diet under consideration or criticism than that of the chemist, particularly to one who is not an expert.

THE MEANING OF THE TERMS USED

There is little need to explain the terms energy-producing or body-building as applied to food materials, beyond saying :—

(i) All bodily energy, whether muscular or secretory, chemical or physical, comes from the slow combustion of materials originally though not immediately, from the food. Such energy includes the heat necessary to keep the body at a constant temperature of approximately 98–99° F.

(ii) All the materials necessary for growth of the body and repair of wear and tear, come from the foods and predominantly from the structural materials underlying the living parts of other animals and of plants.

(iii) The third term, "body-protecting," does need some definition. As originally applied by McCollum to milk and green vegetables it was intended to call attention to the power of those foods to protect from the results of a dietary too predominatingly cereal in nature. Nowadays it is extended to include all foods which by means of some chemical constituent, present often in small amounts, protect the body against deficiency diseases such as anæmia, rickets, osteomalacia, night-blindness, scurvy, beri-beri, and pellagra.

When we turn to the terms used by the chemist and physicist in his approach to dietetics we are on more exact ground.

Energy material.—The calorie (or as perhaps it should be called, the kilocalorie)* is the heat necessary to raise one litre

* The calorie of the physicist is the heat necessary to raise the temperature of 1 gramme of water 1 degree centigrade. The great or kilocalorie used by the physiologist is one thousand times greater.

of water through one degree centigrade. Approximately this is the same as the heat required to raise one pound of water through four degrees Fahrenheit—a more familiar conception. The average male, as will be seen, gives out energy, either in the form of heat or physical energy per day equal to about 3,000 kilocalories and therefore needs to combust material in the body from which this 3,000 kilocalories may be obtained. Most foods will yield calories to the body, but some yield, as will be seen, much more than others.

Body-building material.—Proteins are extremely complex bodies, made mainly of chains of amino-acids coiled into spirals perhaps or wound into balls. Their importance to the body consists in the nature of the amino-acids they contain. Thus the amino-acids arginine, cystine, histidine, lysine, methionine, phenylalanine, tryptophane, and tyrosine are of immense importance in building up human protein. The body cannot get along without them ready made in the food eaten. Consequently a protein which has in it these amino-acids in the same proportion as in human proteins is of the greatest value in human diet; and a protein which has less or none of any one of these acids than human protein has less value in diet.

The way this is usually put is to say that a food protein essentially like human protein has a high biological value, whereas one less like human protein has not so high a biological value. There are proteins which *by themselves* have no biological value, though in a mixed diet they would be useful.

As a generalization useful in practical dietetics it may be said that the animal proteins to be found in cheese, eggs, fish, meat and milk have a high biological value. Egg and milk proteins rather naturally head the list. Vegetable proteins, as in cereals, pulses and nuts, have lower biological values, in the order given.

In practical dietetics it is essential that the diet should contain each day a modicum of animal protein—for the amount see below—as a safeguard. Animal protein not only is valuable as the best material out of which human protein can be built but by its presence enhances the biological value of the cereal and vegetable proteins.

Mineral matters.—Of the ten or a dozen elements the body must have in its diet (apart from carbon, hydrogen, nitrogen and oxygen), the ones about which the dietitian should feel concerned are calcium, copper, iodine, iron and phosphorus. It is rare to come across any deficiency of sodium, potassium, magnesium, manganese, chlorine or sulphur—though sodium deficiency due to increased loss is met with in miner's cramp and in Addison's disease. On the other hand there is evidence, plausible evidence, of calcium deficiency in a large proportion of the populace both antenatally and postnatally till the time of cessation of growth (Leitch, 1937). *A deficiency of calcium in the diet is to be expected in pregnant and lactating women unless special precautions are taken.*

Iron, too, is frequently deficient in the diet of pregnant and lactating women. Menstruation also causes a drain on a woman's supply of iron which must be made good. There is evidence that the hæmoglobin figure of the blood can be raised in apparently normal women to a figure as high as the average man's by iron; and it is possible that the lower figure accepted as normal for women is simply the result of an under-consumption of iron coupled with the recurring loss at menstruation (Widdowson and McCance, 1936a). (The nutritional anæmia of infants hardly comes within the scope of this article.)

Iodine deficiency is suspected wherever there is thyroid trouble—the Pennines, the Cotswolds and the Mendips—and though not all interested in thyroid trouble are convinced, the

majority of workers consider that were the diet adequate in iodine, particularly during pregnancy, childhood and puberty, there would be a marked decrease in simple goitre (Orr and Leitch, 1929).

Vitamins.—These substances around which so many magical and mystical ideas wrongly revolve are in the process of chemical identification and synthesis. There are five—possibly six—which are essential in human diet.

(i) Vitamin A.—Chemically this consists of half the molecule of β-carotene (Holmes, 1937) (the orange pigment of carrots, palm oil, yellow maize) with the terminal carbon atom of the chain oxidized. It is essential for the preservation of skin (Mackay, 1935), mucous membranes (Green and Mellanby, 1928, 1929), and nervous system (Mellanby, 1935). If the diet is deficient in vitamin A, skin lesions, trouble with the conjunctiva, keratinization of respiratory epithelium, night-blindness, xerophthalmia, and keratomalacia, and stone on the kidney are seen. "Nappy" rash also occurs in infants, and it is suspected that broncho-pneumonia may partly be due to lack of vitamin A.

(ii) Vitamin B_1.—Chemically this consists of a pyrimidine ring attached to a thioazole ring (Williams, 1937). It is essential for the oxidation of lactic and pyruvic acids in the nervous system (Peters, 1935), and if the diet is deficient in this vitamin there is widespread paralysis. In man this deficiency accounts for many of the symptoms of beri-beri.

(iii) Vitamin B_2.—One portion of this has been identified with the lactoflavin of milk, a greenish-yellow, crystallizable water-soluble pigment. The flavins of eggs, liver, kidney, malt and grass seem to be identical.

Another portion of B_2 is nicotinic acid (or nicotinamide) and this plus lactoflavin are essential in the animal and presumably the plant cell for the purpose of oxidizing the carbo-

hydrates. In man absence, of the nicotinic acid portion results in pellagra and most of the symptoms of pellagra can be cured by either nicotinic acid or nicotinamide.

(iv) Vitamin C.—This (until recently (Szent-Györgyi, 1936)) was considered to be ascorbic acid, a highly reducing " acid " closely related in structure to the hexose sugars. In its absence from the diet scurvy appears, and scurvy it is claimed has been cured by pure crystalline synthetic ascorbic acid. Györgyi considers that the hæmorrhagic symptoms of scurvy are due not to the absence of ascorbic acid from the diet but of a substance hesperidin which usually accompanies ascorbic acid in fruits and vegetables.

(v) Vitamin D.—This is a substance (or set of substances) formed by the action of ultra-violet light on the sterols. An "artificial" vitamin D is on the market as calciferol. The function of this vitamin is to make the calcium of the diet available for bone and teeth formation. By lowering the pH of the small intestinal it enables the body to absorb calcium, and it undoubtedly catalyzes the deposition of calcium phosphate in the bones and teeth. When the diet is deficient in vitamin D, malformation of bone (Mellanby, E., 1925), (rickets, osteomalacia) and teeth results (Mellanby, M., 1934).

(vi) Vitamin E.—This substance is a mixture of two complex alcohols, called tocopherol α and β. Its presence in the diet is essential for reproduction in the rat. The only reason for supposing that it is important in human nutrition is that women with histories of repeated abortion have been successfully brought to full term by the administration of massive doses of a concentrate of vitamin E (Currie, 1936).

Vitamins deficient in British diet.—Of these vitamins it is certain that D is the most commonly deficient in the diet, followed by A, C, B_1 and B_2 in that order. And it may safely be said that if a diet is satisfactory as regards D, A and C, it is

satisfactory as regards B_1 and B_2, particularly if the common articles of diet are used. It is quite possible by means of concentrates to produce a diet rich in A, C, and D which might be deficient in B_1 and B_2, but if the normal sources of these vitamins are relied on, and more particularly if care is taken to obtain a reasonable amount of animal protein, there is no risk of a deficiency of the B vitamins.

NATURAL SOURCES OF MINERAL MATTER AND VITAMINS

Calcium.—The richest source among foods is cheese (0·8 to 0·9 per cent.), followed by whitebait 0·859, sprats 0·707, sardines, 0·409. The source most readily taken is cows' milk (0·120 per cent.) Other sources are egg yolk (0·135). Spinach 0·595,* watercress, 0·222, and broccoli tops 0·160. It is noteworthy that the boiling of green vegetables hardly reduces their content of calcium. Boiling in hard water increases it.

Phosphorus.—The content of phosphorus runs roughly parallel with the calcium except that meat is a good source of phosphorus, and vegetable products are often deficient in phosphorus and when it is present it is often present as phytin in which form the phosphorus is unavailable. Cheese has about 0·54 per cent., whitebait 0·86, sprats 0·64, sardines 0·68, cows' milk 0·094, whole egg 0·254, meats and fish about 0·250. Brown bread has 0·198 with 0·082 (balance 0·116) unavailable, rolled oats 0·339 with 0·224 (balance 0·115) unavailable. Spinach has only 0·098 (all available), watercress only 0·052 and broccoli tops 0·054 per cent.

Iron.—The foods with available iron in reasonable amounts are calf's and pig's liver (13 and 20 milligrammes per 100 grammes), eggs 2·5, oatmeal 4·0, dried fruits 2·3 to 3·7 or

* The availability of the calcium in spinach is very seriously questioned and it is best not to rely on it for that element. The same is true of its iron.

even 4·0, spinach 2·4.* Black treacle is a noteworthy source of iron—9·17 mgm. per 100 grammes. Meat is not a good source of available iron.

Iodine.—The noteworthy sources are the fish and the edible seaweeds. A long way after them comes watercress, whereas the iodine content of vegetable products is so variable that we cannot rely on these as a source of iodine.

Vitamin A.—The dairy products and green and yellow fruits and vegetables are the best source of these. The international units present in some of these foods are as follows :—milk 60–540 per 100 grammes (340–3,060 per pint); butter 800–6,800; Cheddar cheese 5,500; eggs per egg 39–1,320; cabbage 900; spinach 2,630–6,500; apricots 1,800–2,300; carrots, 1,900–9,600; French beans 950; runner beans, 600.

Vitamin B_1.—Yeast and wheat germ are the best sources but variable in amount. As much as 23 units per gramme and as low as 6·0 are found; whole wheat and oatmeal run about 3 units per gramme. Most fruits, vegetables, and meats run to about 0·5 units per gramme, but meats derived from the pig have a much higher figure (i.e. 2 to 3) (Baker and Wright, 1935). White bread made from straight-run flour is by no means devoid of vitamin B_2, as has been so commonly believed. The figure is 0·17–0·25 per gramme. (Copping and Roscoe, 1937).

Vitamin C.—The best sources are the raw summer fruits, the raw salad vegetables and the citrous fruits. Cooking and canning does not result in so much destruction as was thought, though as in the cooking and canning much of the vitamin C does pass out into the fluid if the latter is discarded, such processes result in a large loss. Storage of vegetables does,

* See footnote p. 24.

unfortunately, result in a very large loss of vitamin C, though it is less at low temperatures. The following figures give the amount of fruits and vegetables which supply 30 mgm. of vitamin C (or rather, ascorbic acid), which is reckoned a sufficient day's ration: Black currant, $\frac{1}{2}$–$\frac{3}{5}$ oz. (Olliver 1936); strawberry, 1$\frac{1}{4}$–2; orange juice, 1$\frac{1}{2}$–5$\frac{1}{2}$; gooseberry, 2$\frac{1}{4}$–3$\frac{3}{4}$; loganberry, 2$\frac{1}{4}$–5$\frac{1}{4}$; raspberry, 3$\frac{1}{2}$. When cooked by boiling the figures are, black currant, $\frac{1}{2}$–1 oz.; brussels sprouts, 2$\frac{1}{4}$–4; asparagus, 2$\frac{3}{4}$–5; spinach, 2–8$\frac{1}{4}$; gooseberry, 3$\frac{3}{4}$–7; loganberry, 4–4$\frac{3}{4}$; new potato, 4$\frac{1}{4}$–5$\frac{3}{4}$. Other foods, with exception of the raw salads, need so large a consumption as to be negligible in practice, with the exception of one apple—the Bramley's seedling, which, raw or cooked, is an excellent source of vitamin C.

Vitamin D.—Here really is the crux of the vitamin problem. Few foods are a good source of vitamin D, and it may well be asked if it may not be necessary to have recourse to concentrates. Milk does not exceed 50 units per pint and may be as low as zero. Butter runs from 10–100 units per oz. (Empire butter has the highest figures.) Egg yolk runs from 30–100 units per yolk. The body oil of the fat fishes has a high value (350 per oz.) and fish-liver oils a still higher value. Cod-liver oil may have a value as high as 1,000 units per teaspoonful, and halibut-liver oil 40–80 units per drop (Coward and Morgan, 1935).

Summary of sources of inorganic substances and vitamins.—Anyone who has the patience to wade through this mass of facts will note that various foods occur again and again as sources of this or that element or vitamin. For general purposes it may be concluded that the foods which will supply the necessary mineral matters and vitamins are to be found in :—

I. The dairy foods, milk, butter, cheese and eggs.

II. The summer fruits, the citrous fruits, and yellow and green vegetables.

III. Sea fish, and especially the oily fish.

The logically minded may wish to extend the list by adding the germ and bran of cereals and liver (or perhaps glandular foods in general), but there seems but little need for this. For practical purposes the above is a comprehensive statement of the case and needs but little expansion. (*See also* table.)

THE DAILY RATION

It now remains to give a summary of what is generally agreed should be the daily ration of foods to supply energy, body-building material and protective foods. The figures are taken direct from *The Problem of Nutrition*, Vol. II, *Report on the Physiological Bases of Nutrition*, drawn up by the Technical Commission of the Health Committee, and published by the League of Nations.

Calorie Requirements

For every male and female adult. 2,400 calories per day plus the following for muscular activity :

Light work up to	75 calories per hour of work.
Moderate work up to	75–150 ,, ,,
Hard work - -	150–300
Very hard work -	300 calories and upwards.

For every child	Age 1–2	840 calories per day
	2–3	1,000 ,, ,,
	3–5	1,200 ,, ,,
	5–7	1,440 ,, ,,
	7–9	1,680 ,, ,,
	9–11	1,920 ,, ,,
	11–12	2,160 ,, ,,
	12–15	2,400 ,, ,,
	15 and upwards	2,400 ,, ,,

With a supplement for boys and girls 5–11 of 75 calories per hour.
,, ,, boys only 11–15 of 75–150 ,,
,, ,, girls only 11–15 of 75 ,,

For pregnant women - - - 2,400 calories per day
For nursing ,, - - - 3,000 ,, ,,

PROTECTIVE FOODS

Content of Calcium, Phosphorus, Iron, and Vitamins A, B_1, C, and D

	mgm. per oz.			International units per oz.				Notes
	Ca	P	Fe	A	B_1	C	D	
Dairy Foods :								
Butter	4·2	7·0	0·05	226–1,940	—	—	24–113	
Cheese (Hard)	230	154	0·2	1,556	1	—	—	
„ (Soft)	205	137	0·2	—	1	—	—	
Eggs (Per egg)	29	140	1·6	24–1,320	15	0	23–75	
Milk	34	27	0·03	17–153	6·5	negligible	negligible	
Salad Vegetables :								
Mustard and Cress	19	19	1·28	—	14	—	—	
Radishes	12	8	0·54	1	0·2–2·0	70–114	—	
Tomatoes	4	6	0·12	4,000–10,000	11	74–216	—	
Watercress	63	15	0·46	—	17	136–431	—	
Green Vegetables :								
Cabbage	13	7	0·13	255	7	113–807	—	Vitamin A and C figures are for raw vegetable.
Sprouts	8	13	0·18	—	17	414–818	—	Vitamin C figure for raw vegetable.
Spinach	[169]	26	[1·13]	746–1,840	5·7–20	34–703	—	„ „ „
Turnip Tops (boiled)	28	13	0·87	—	—	—	—	Vitamin A probably high.
Carrots	10	5	0·11	567–2,740	3	—	—	
Summer Fruits :								
Currants (black)	17	12	0·36	85–140	0–6	772–1,248	—	
„ (red)	10	8	0·35	—	3–6	283	—	
Gooseberries....	5	5	0·16	—	—	156–266	—	
Loganberries	10	7	0·39	—	—	116–274	—	
Raspberries	12	8	0·34	—	7–10	173	—	
Strawberries	6	7	0·20	—	traces	261–439	—	
Citrous Fruits :								
Grape Fruit	5	4	0·07	—	11	147–369	—	
Lemon Juice (fresh)	8	10	0·14	—	—	143–404	—	
Orange Juice (fresh)	12	7	0·09	85–113	11	125–504	—	
Fat Fish :								
Bloaters	23	65	0·41	—	—	—	—	Probably useful for vitamins A and D.
Herrings	16	84	0·52	138–182	0	—	284	
Kippers	8	54	0·18	—	—	—	—	„ „ „
Salmon (fresh)	6	62	0·16	—	—	—	—	„ „ „
„ (tinned)	18	79	0·36	0–23	—	—	57–227	
Sardines	116	194	1·14	687–7,650	—	—	227	
Whitebait	244	243	1·44	—	—	—	—	„ „ „
Sundries :								
Bacon	2	44	0·26	Probably 0	79–136	Probably 0	0	
Ham	5	70	0·74	„	62	„	0	
Liver	9	576	5·20	234,000 to 432,000	42	187	0	
Wholemeal Bread	9	56	0·76	29–129	35	Probably 0	Prob 0	

AMOUNTS NEEDED PER DAY :

Calcium—600–700 mgm. for an adult male and non-pregnant adult female.
1,000–1,600 mgm. for a pregnant or nursing female.
or more
1,000 mgm. for a child up to 14.
1,600 mgm. for an adolescent.

Iron — 10–15 mgm. for almost anyone at any age. Females after puberty need at least as much as a male.

A—5,0 00International Units. B_1—300–500 International Units.
C—600 „ „ D—250 „ „

Protein Requirements

Adult males and females. 1 gramme protein per kilogramme body weight (i.e. about 70 grammes per average male and 56 per average female).

Children	1–3	3·5	grammes	per kilo	bodyweight
	3–5	3·0	„	„	„
	5–12	2·5	„	„	„
	12–15	2·5	„	„	„
	15–17	2·0	„	„	„
	17–21	1·5	„	„	„
	21 and upwards	1·0	„	„	„
Pregnant women	0–3 months	1·0	„	„	„
	4–9 „	1·5	„	„	„
Nursing „		2·0	„	„	„

Protective Foods.

No figures are given, but the importance of protective foods (milk, milk products, eggs, glandular tissues, green-leaf vegetables, fruit, fat fish and meat) is emphasized.

Especial emphasis is laid upon adequate calcium, phosphorus, iron, vitamins B_1, B_2, C and D during pregnancy and lactation. For growing children a high proportion of protective foods are recommended.

There are estimates for the necessary amounts of mineral element and vitamins which have been put forward, though they are still open to correction and alteration. For calcium 0·6 grammes per day for the adult male and female; 1·2–1·6 grammes for children and adolescents 1·6 grammes for pregnant and nursing women. For phosphorus the yield should be a little more. Ten milligrammes of available iron are probably satisfactory, though pregnant and lactating women might with advantage have 15 mgm. A supply of 5,000 units of vitamin A, 300–500 units vitamin B_1, 30 mgm., i.e. 600 units ascorbic acid and 250 units of vitamin D will probably cover all needs.

THE USE OF STANDARD FIGURES

These figures for calorie, body-building and protecting materials are useful in so far as they enable us to make a comparison between a known diet and a standard, but they do not aid much in deciding if a diet is satisfactory for an individual. When they are compared with what is actually taken in individual diets of people with no restrictions in purchasing food and in apparently good health, it is realized that diets may

deviate far from the average without immediate noticeable effect, and that a hard and fast rule is completely inapplicable in diet (Widdowson and McCance, 1936a), thus the figures for the calorie intake of men may vary from 1,772 to 4,955, for the protein from 97·6 to 167 grammes, the animal protein from 66·6 to 121 grammes, the calcium 0·87–1·96, the available iron 10·8 to 18·7 milligrammes, and so on. The women show a similar wide variation. To give examples, the calcium runs from 0·23 to 1·16 grammes per day, and the available iron runs from 5·0 to 12·4 milligrammes per day. We suspect that the low value for calcium, if persisted in, may result sooner or later in osteoporosis, and we know that the average figure for iron (7·9 mgm. per day) can be improved upon.

As regards children there are no reliable figures yet in this country, and one must be forgiven for being entirely sceptical of the value of the figures quoted above, and particularly of the index figure assigned to children. Thus in the past it has been customary to consider the calorie needs of a child of (say) three, as a definite fraction of the needs of the adult male (0·42 or 0·5). In view of the fact that the adult male varies so much in his intake it is hard to believe that the child does not vary also as much, and to give an index figure is mathematically absurd, however much it may conduce to clear statement and the support of dogma. Moreover, the index figure applies to calories only, and must not be used to calculate the need for animal protein or mineral matters or vitamins. The need of a child for calcium for instance, is greater than that of an adult male. To calculate from the index figure for calories of a family the need of that family for calcium, iron, iodine, or vitamins is the negation of sound dietetics, of which not even reports of the Ministry of Health and the Medical Research Council Reports have been innocent.

PRACTICAL COUNSEL IN DIETETICS

It has been seen that for any one person the strict chemical approach to diet is difficult and, in the present state of ignorance, unscientific. Meanwhile something practical has to be done in devising diets to meet general and specific cases. It is not possible to wait till the scientist has dotted his last i and crossed his last t in dietetics any more than in the 19th century they could wait for the discovery of microbes before they went ahead with sanitation. There is enough known in dietetics for dietitians to get ahead at once. It is only necessary to discard the chemical approach and adopt the physiological approach.

If any of the three quanta: energy-producing, body-building and body-protecting material is lacking from a diet, that diet is useless. To the necessary ration of energy-producing material instinct is in some sort a guide. Most people—certainly all people who lead a healthy life—adjust their intake of food to their calorie needs with extraordinary accuracy. But for body-building and body-protecting purposes instinct is no guide—witness the diet of the Kikuyu (Orr and Gilks, 1931) and the troubles that beset the native races when they take over the diet of the European (scurvy, rickets, beri-beri).

Consequently the practical way in which to tackle the provision of a suitable diet is to begin with the protective foods, then proceed to the body-building foods, and then to leave the energy-producing foods to the dictates of appetite. If the usual foods upon the market in England are used much as they are used by the middle classes, such a diet will be as good as can be provided in the present state of our knowledge in dietetics. The recommendations of the League of Nations Health Committee proceed implicitly upon those lines.

The adult male.—It is here suggested that a satisfactory diet for an adult male will be found in the following :—

I. PROTECTIVE FOODS	(*a*)	Milk	1 pint per day (taken in any form)
		Butter	1 oz. „ (=two restaurant pats)
		Cheese	1 oz. „
		Egg	1 „
	(*b*)	Raw salad, or raw summer fruit or fresh orange, lemon or grape-fruit	1 serving per day
	(*c*)	Herring, sprats, kipper, bloater, whitebait, salmon, mackerel, fish roes	1 serving or better 2 servings per week

II. BODY-BUILDING FOODS.—The minimal ration is very nearly attained by use of the above on the non-fish days, on the fish days it is easily reached. To make it safe add each day—

Meat, bacon, ham, poultry, game, fish or liver 3 to 4 oz., weighed uncooked, or 2 to 3 oz. cooked (small to large helping) per day.

III. ENERGY-PRODUCING FOODS.—Cereals, fats, sugars, dried fruits, jam, root vegetables, green vegetables, fruit, till the appetite is satisfied. The normal food habits of the British may as regards these be followed.

The non-pregnant female.—Proceed on exactly the same lines. This ensures that the woman receives a satisfactory amount of protective food and body-building food. She may easily need more of these than the male because of the cyclic changes of, and losses from, the uterus.

The pregnant or nursing woman.—Proceed on the same lines except that the milk intake should be raised to one quart. This diet is practically that of the League of Nations Health Committee except that they add cod-liver oil (one teaspoon, for vitamins A and D), give rather more meat, and count potatoes and pulses among the protective foods, whereas the writer would put them among the energy-producing foods. (One cannot be logical !)

The child.—As regards the child it seems reasonable to adopt the same procedure: i.e. make sure of the body-protecting and

body-building foods and leave appetite to determine the calories. With a young or greedy child this might result in a ketosis and so the following suggestions, based on those of the League of Nations Committee are given.

Child. Age 12–14 years

As for adult males, except that they may possibly not take so much of the energy-producing foods. On the other hand they may often take more. The writer's experience is that the boy's appetite somewhat suddenly becomes enormous in the last prepubertal year and remains high till puberty and/or growth is finished.

Child. Age 7–12.

As above. Probably much less of cereals will be taken.

Child. Age 5–7.

I. Protective Foods—	
(a) Milk	1 pint per day
Butter	½ to 1 oz. ,,
Cheese	1 oz. ,,
Egg	1 ,,
(b) Raw salad, raw summer fruit, or orange, lemon or grapefruit	1 serving per day.
(c) Herring or other fat fish	1 or 2 servings per week.
II. Body-building Foods.—Meat, poultry, game, fish	2–3 oz. per day.

III. Energy-producing Foods.—Cereals, sugar, jam, treacle, plus potatoes and other vegetables (best supply vegetables such as potatoes, greens, carrots, etc., with the meat as is usual) to satisfy appetite.

Child. Age 3–5

I. Protective Foods—	
(a) Milk	1 pint per day
Butter	½ to 1 oz. ,,
Cheese (dried, grated)	½ to 1 oz. ,,
Egg	1 ,,
(b) Raw salad, raw summer fruit or orange, lemon or grape-fruit	1 serving per day.
(c) Fish roe, fat fish (bones removed and body put through mincer)	1 serving once or twice per week.
II. Body-building Food.—Meat, poultry, fish	1½–2 oz. per day.

III. Energy-producing Foods.—Cereals, sugar, jam, treacle, potatoes, root vegetables, greens to satisfy appetite.

CHILD 2–3 years

I. PROTECTIVE FOODS	
(*a*) Milk - - - - - - -	1 pint per day
Egg - - - - - - -	1 ,,
Butter - - - - - -	½ oz. ,,
(*b*) Raw vegetable or fruit as above or raw tomato, swede, or orange juice	At least 1 and preferably 2 oz.
(*c*) Herring roes, or fat fish with bones removed and body put through a mincer	1 to 2 oz. once or twice a week
II. BODY-BUILDING FOODS.—	
Minced meat, fish, poultry - -	1 to 2 oz.
or	
Grated dried cheese - - -	1 oz.

III. ENERGY-PRODUCING FOODS—

Root vegetables, cereals, sugar, jam, treacle to satisfy appetite.

CHILD 1–2 years

I. PROTECTIVE FOODS—	
(*a*) Milk - - - - - - -	1 pint per day
Egg - - - - - - -	½ to 1 ,,
Butter - - - - -	¼ to ½ oz. ,,
(*b*) Raw vegetable or fruit juice -	1 to 2 oz. ,,
Sieved greens, etc. - - -	1 oz. ,,
(*c*) Cod-liver oil - - - - -	½ to 1 teaspoon per day.
II. BODY-BUILDING FOODS—	
Minced meat, fish, poultry, etc. -	1 to 2 oz.
or	
Grated dried cheese not more than	1 oz.

III. ENERGY-PRODUCING FOODS—

Sieved root vegetables, rusks, toast Melba, dry bread, jam, treacle to satisfy appetite.

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CHAPTER II

SICK ROOM MENUS AND RECIPES

By R. H. WANSBROUGH, S.R.N., D.M.

IT is essential in all cases of prolonged sickness and convalescence that the diet should meet the requirements of the body, and supply all the necessary food constituents in such a form as is attractive to the patient, and at the same time suitable to his condition. It is necessary first of all to consider the normal diet and food requirements, and then to see how these can be supplied to the patient in a suitable form.

The normal diet is one which supplies the following substances in adequate quantities:—

PROTEINS for growth and maintenance of body tissues
FATS, CARBOHYDRATE in suitable proportions
(to furnish the calories required.)

MINERAL SALTS, the most important being calcium, phosphorus and iron.

VITAMINS.—A, B_1, B_2, C, D.

WATER.

ROUGHAGE..

THE EFFECT OF DISEASE UPON REQUIREMENTS

Calorie requirements.—In all cases of acute illness the patient will probably be at rest in bed, so that the energy requirement for activity is automatically reduced. It is important to bear in mind that in certain conditions in which activity is reduced to a minimum, e.g. fractures of the lower limbs or other crippling conditions in which there is no constitutional disturbance, or in convalescence from rheumatism, the appetite of the patient

will probably remain normal. He will be inclined to eat as much as usual, or even foods of a higher caloric value (special delicacies prepared by kind friends and relatives) so that the caloric value of the diet will be greater than the requirement of the patient. The patient will then gain a considerable amount of weight which will add unnecessary strain to the limbs or organs, when normal activity is gradually resumed. Of much greater importance to the caloric requirement of the patient than the effect of activity is the effect of fever on basal metabolism. It has been shown that for every increase in body temperature of 1° Fahrenheit the basal metabolism is increased by 7 per cent., so that in spite of the fact that the patient is in bed, at rest, the caloric requirement may be as high as 3,000 to 4,000 calories per day.

Protein, fat, and carbohydrate requirements.—It is important that the protein requirement of the patient is satisfied, and that by an adequate proportion of first-class protein, as there is no decrease in protein metabolism with lowered activity. There is, however, a definite increase in protein metabolism in most cases of severe infections such as typhoid fever. The loss of protein can be greatly reduced by giving a diet with a high caloric value, without much increase in the protein content; this increase in calories will be accounted for by fat and carbohydrate. It is these two classes of foodstuffs—fats and carbohydrates—which are largely responsible for determining the caloric value of the diet, and it is usually these that are increased, or decreased according to the energy requirement of the patient. The actual use of each in the diet will depend largely upon the individual patient, upon his likes and dislikes as well as upon the state of his digestion. The fat content of the diet can be increased, without increasing the bulk of the diet, by using cream in the preparation of dishes, such as creamed soups, or in any dish in which milk is used a

small quantity of the milk can be replaced by an equal quantity of cream. Cream can also be used in the preparation of puddings and ice cream. Butter can be added to vegetables, or olive oil used in salad dressings. The fat cannot, as a rule, be greatly increased when there is a disturbance of the digestion, or in cases in which there is marked nausea, or when the carbohydrate content of the diet is very low, as ketosis may result.

The carbohydrate is most easily increased in the form of sugars, glucose being given in fruit drinks, or it can be used in the preparation of puddings; it has the advantage over cane sugar in that it is not so sweet to taste, so that more can be added at one time. It is usually found that patients who are acutely ill, with dry mouths and furred tongues, do not like sweet foods, but this can often be overcome, as far as fluids are concerned, by the addition of lemon juice.

In cases of acute illness, of short duration, little harm will result if the patient is unable to take an adequate diet for a few days, but in all cases of prolonged sickness, such as typhoid fever, pneumonia, tuberculosis and other infections, it is of utmost importance to maintain the patient's strength by giving an adequate diet throughout the course of the illness. This is not an easy task, as the patient's appetite is usually not at all good, and digestion may be impaired. A great increase in the fat or carbohydrate content of the diet, may result in abdominal distension or diarrhœa, but in either case it has been found that if the diet is changed, and the fat increased instead of the carbohydrate or *vice versa*, the disturbance will be relieved.

Mineral salt content of the diet. Calcium.—Invalid diets usually contain at least one pint of milk. The calcium derived from the milk will probably be supplemented by calcium from other sources, such as eggs, fruits and vegetables, so that the

daily requirement of 0·7 gm. will be supplied; this is usually accepted as the requirement for an adult.

Iron.—If the diet contains a high proportion of milk in relation to the other foods, there is likely to be a deficiency of this mineral salt in the diet. When, however, the diet contains eggs, fruits and vegetables in a good proportion there is not so much risk that this salt will be lacking, and it is chiefly in those cases in which there is a loss of blood from any cause that it is necessary to supplement the iron provided in the diet.

Vitamins are essential for the maintenance of health, and it is even more important that during illness they are provided in adequate quantities.

Vitamin A will be provided in the diet during all stages of sickness by orange juice, butter, eggs, milk and later by other fruits and vegetables.

Vitamin B_1 and B_2.—These are vitamins of which there is likely to be a shortage in the invalid diet, and it is important that they be provided in sufficient quantities. If there is a good supply of vitamin B_1 in the diet throughout the course of a long illness, there is more likelihood that the appetite of the patient will be maintained, and in some cases restored. It will be of real benefit to the patient if the intestinal tract is kept in a good state of "tone," as he will be more likely to be able to take and digest a good diet. Vitamins B_1 and B_2 can be added to the diet in some concentrated form such as marmite; this can be introduced in a number of ways, such as soup, spread on toast, or in sandwiches, used in the making of gravy, or added to savoury dishes.

Vitamin C requirement is greatly increased in certain diseases, and it is essential that in tuberculosis and other febrile conditions the foods which supply this vitamin are increased. This will mean that orange juice and lemonade

made from fresh lemons should be supplied freely and in a light diet; salads and other fresh fruit should be added.

Vitamin D.—If the patient is receiving open-air treatment or artificial sunlight he will probably be laying up a fairly good store of this vitamin. From the diet he should be receiving a fair supply of eggs, butter, cream and milk, all of which are good sources of vitamin D, and only in a few cases will it be necessary to supplement by the use of concentrated forms of the vitamin such as cod-liver oil, halibut oil. It is well to bear in mind that if cod-liver oil, either in the pure form, or as an emulsion, is added to the diet, the caloric value will be considerably increased, and if it is used in a preparation with malt, the vitamin B content will be increased; by using halibut oil there will be practically no increase in the caloric value, but in all cases there will be an increase in the vitamin A content of the diet.

Fluids.—The importance of fluids in all conditions, and especially during a febrile state, has long been recognized, but it is not always easy to persuade the patient to take as much fluid as is desirable. Every effort has to be made to persuade the unwilling patient to take fluids. Before a drink is offered to the patient, he should have received all the necessary nursing attention, and be in a comfortable position. It is also important that hot fluids are served really hot, but yet not so hot that the patient cannot drink them, and cold fluids must be really cold or iced, not served tepid. Children can often be persuaded to take fluids by serving the drinks in coloured glasses, or offering them straws through which to suck them, or even by using a little colouring to milk or water. It is as important that drinks, as well as other food, should always be served to the patient in small quantities.

Roughage is essential in the diet, except in certain diseases of the intestinal tract. It is derived from the indigestible part of

the food, and helps to keep the colon in a healthy condition, as it acts as a stimulant to peristalsis, and it forms the bulk of the fæces. Roughage consists chiefly of cellulose from fruits and vegetables, and gristle, skin and other indigestible parts of meat, fish and other foods.

GENERAL RULES FOR DRAWING UP MENUS AND PREPARING MEALS FOR THE SICK

It is important that as much variety as possible is obtained in all sick-room menus; this does not mean only that actual dishes and foods are not given repeatedly, but that there also must be variety as to colour, texture and flavour.

Colour.—This is the first thing that the patient will notice at any meal, and therefore it must always be carefully considered, and as much variation as possible introduced; steamed fish, with white sauce, creamed potato, and puréed parsnips would be an unattractive combination, but if the sauce was changed to parsley sauce, and puréed carrots given, the dish would be attractive.

Texture.—Here again variation must be introduced whenever possible, although in a fluid or soft diet this is almost impossible, but with a light or fancy diet, it would be a poor combination if potato soup was followed by ground rice pudding.

Flavour.—This must be varied as much as possible, and a savoury dish can be followed by a bland sweet, or a bland dish followed by a dish with a tart flavour, e.g. grilled tomato and anchovy toast, followed by a milk jelly or custard, but macaroni cheese should be followed by some sweet such as egg and lemon jelly.

Temperature.—It is a good plan to vary this as much as possible and in each meal to give both hot and cold foods.

USES OF CERTAIN DISHES IN THE SICK-ROOM MENU

Soups can be used for three main purposes in the diet—

(*a*) To stimulate the gastric secretion, and so stimulate the appetite.
(*b*) As a means of giving fluids.
(*c*) To increase the caloric value of the diet, by giving thick and creamed soups.

Vegetables—

(*a*) Supply vitamins and mineral salts.
(*b*) Can be used for flavouring.
(*c*) Increase the caloric value of the diet.

(1) By the actual food value of the vegetables; this applies chiefly to root vegetables.
(2) As a means of adding butter or cream to the diet.

Beverages—

(*a*) Supply the fluid required by the body.
(*b*) The means by which all the foodstuffs can be given.

Sweets and desserts chiefly supply carbohydrate and fat, and a low proportion of protein.

Fruits can be used in the diet—

(*a*) For their mineral and vitamin content.
(*b*) For giving additional carbohydrate as sugar; or fat as cream.
(*c*) For flavouring.

SAMPLE DIETS

FLUID DIET

The amount that it is possible to give in a fluid diet depends almost entirely on the condition of the patient, and the state of his digestion.

6 am. 5 oz. milk.
½ oz. cream. Tea if desired.

8 a.m. 6 oz. milk.
1 egg.
9 a.m. Glucose lemonade, 8 oz.
12 noon Creamed vegetable soup.
5 oz. milk flavoured with coffee, iced.
2 p.m. 6 oz. milk.
½ oz. cream, Benger's.
4 p.m. 1 oz. cream in 5 oz. ginger ale.
6 p.m. 6 oz. milk.
1 egg.
8 p.m. 4 oz. orange juice, 1 oz. glucose } with lemon.
10 p.m. 6 oz. milk, ½ oz. cream } flavoured with ovaltine.
12 midnight, or during the night.
6 oz. milk.

The caloric value of this diet is approximately 2,000 calories, but it would be possible to increase this—

(*a*) If the patient could take larger feeds, 10 oz. could be given at each feed.

(*b*) If the patient could tolerate a higher fat content, ¼ oz. cream could be added to each feed.

(*c*) 2 pints of lemonade, ½ lb. glucose, Juice of 3 lemons } to be taken in small quantities throughout the day, between regular feeds.

The protein value could be increased by the addition of casein or "Casec" to any of the feeds (1 dessert-spoonful=½ oz.=15 gm. protein), although the flavour is often disliked by the patient.

SOFT DIET

Approximate—Carbohydrate 260 gm., protein 86 gm., fat 160 gm. Total calories 2,800.

6 a.m. 6 oz. milk.
½ oz. cream. Tea if desired.
8 a.m. Groats or fine oatmeal made with milk, sugar. Cream 1 oz.
Tea with milk. Thin bread and butter.
10 a.m. Cream 1 oz. with ginger beer.
12 noon Creamed vegetable soup.
Glucose lemonade, 6 oz.
2 p.m. Milk pudding, semolina, ground rice or cornflour. Fruit purée.
2 oz. orange juice.
½ oz. glucose.

4 p.m. 6 oz. milk.
1 egg.

6 p.m. Milk jelly or baked custard.
1 oz. milk flavoured with coffee, hot. Thin bread and butter.

8 p.m Milk 8 oz.
½ oz. cream, ovaltine.

10 p.m. 1 oz. milk.
½ oz. cream. Benger's.

12 midnight, or during night.
8 oz. milk, flavoured as desired.

LIGHT DIET

7 a.m. Tea with milk
1 biscuit, or bread and butter.

3.30 a.m. *Breakfast*—
Grape fruit, or other fruit
Cereal
Egg
} A choice of two out of these three courses.
Toast, butter, marmalade.
Tea or coffee to drink.

11 a.m. Glucose lemonade, biscuit.

1 p.m. *Dinner*—
Fish, chicken, veal.
Potato, vegetables.
Light pudding.
Juice of two oranges with ½ oz. glucose.
Bread or toast.

4 p.m. *Tea*—
Bread, butter, jam, salad or marmite with bread.
Tea with milk.
Sponge or madeira cake.

7 p.m. Creamed vegetable soup or vegetarian dish.
Milk jelly or baked custard.
Toast.

10 p.m. Ovaltine to drink.

N.B.—Brown bread should be given at one meal at least.

SUGGESTIONS FOR DISHES FOR LIGHT DIET

Breakfast—

Cereals: Puffed rice, rice crispies, shredded wheat, puffed wheat, cornflakes, porridge, Force served with banana.

Meat Dishes suitable for Dinner—

Fish, steamed, fried, boiled, baked. Fish pudding. Fish custard. Fish mayonnaise served with salad. Mock crab served with salad. Chicken, roast, boiled, fricassee, creamed.

Hot Sweets—

Cereals, rice (unpolished). Ground rice, semolina, sage, tapioca, vermicelli, made plain or with egg, and served with fruit. Steamed pudding, served with white sauce, jam sauce or treacle. Bread and butter pudding. Queen of puddings.

Cold Sweets—

Milk jelly. Egg and milk jelly. Spanish cream. Egg and lemon jelly. Floating island. Foam pudding. Sago or rice custard. Rice, sago or semolina mould, served with jam. Chocolate blancmange. Baked custard. Fruit fool.

Savoury Dishes—

Cheese custard. Spaghetti and cheese. Spaghetti and tomato. Baked potato, or stuffed potato. Vegetable stew. Potato souffle. Creamed vegetable soup. Baked egg in tomato. Stuffed tomato.

RECIPES

Lemonade—

3 lemons.
2 oz. sugar.
1 pt. water.

Peel the lemons thinly, and put in a jug with the sugar, add 1 pint boiling water and stand to cool. Add strained lemon juice.

Glucose Lemonade—

Make as for sweetened lemonade, but omit the sugar, in one pint of lemonade dissolve ¼ to ½ lb. glucose.

Potato Soup—

1 potato.	½ onion.
¼ pt. water.	2 oz. cream.
¼ pt. milk.	1 dessertspoonful flour. Seasoning.

Cut the onion and potato in small pieces, put in cold water (¼ pint) and cook till soft; rub through hair sieve. Mix this purée with the milk and heat. Mix flour and cream and to this add the boiling mixture, stir well, and return to pan and cook for at least five minutes. Season.

Creamed Vegetable Soup—

Use any vegetable desired instead of potato and onion.

Baked Fish—

Take some filleted fish, wash and roll it. Place in a small dish with 1 teaspoonful of butter, cover with paper and bake in moderate oven about 10 minutes.

Steamed Fish with Sauce—

4 oz. filleted fish. ¼ oz. butter. 4 oz. milk.

Put the fish in a small dish, season; add butter and milk, cover with paper and cook in moderate oven about ten minutes. Strain off the milk and use this to make a sauce.

Chicken Fricassee (for using cooked chicken)—

½ pint chicken stock. 5 oz. chicken, without bone.
1 medium-sized onion, carrot, and small piece of turnip.
3 oz. milk. 1 dessertspoonful of rice or pearl barley.

Cut the root vegetables into ¼ inch cubes, put into the stock with the rice (or barley, previously blanched, season. Simmer till rice is well cooked about ¾ hour, add chicken cut into small pieces, and milk, and simmer for about 5 minutes.

Mock Crab—

4 oz. white fish.
1 large tomato or tomato juice or tinned tomato. Seasoning.

Boil the fish, and then flake. Rub the tomato through a hair sieve, season and mix with the flaked fish. Serve with salad.

Egg and Milk Jelly—

½ pint milk. ¼ oz. gelatine. 1 teaspoonful sugar.
1 egg. Flavouring.

Soften the gelatine by soaking in cold water. Heat the milk, and sugar, add to the beaten egg, cook till it thickens slightly, pour on to gelatine, flavour. Pour in two moulds and allow to set.

Milk Jelly—

½ pint milk. Flavouring. 1 teaspoonful sugar.
¼ oz. gelatine. Colouring.

Soften the gelatine by soaking in cold water for a few minutes. Warm the milk, and sugar, dissolve the gelatine in it, add flavouring, sugar, colouring. Allow to set in two small moulds.

Spanish Cream—

1 egg. Flavouring.
½ pint milk. Colouring.
¼ oz. gelatine. 1 teaspoonful sugar.

Separate the white from the yolk of the egg. Heat the milk and sugar, add to beaten yolk, return to saucepan and cook till it thickens slightly.

Pour on to gelatine (which has been softened by soaking in cold water). Flavour and colour as desired. Allow to cool. When cool and almost set, fold in stiffly beaten egg white. Allow to set in two prepared moulds.

Egg and Lemon Jelly—

¼ oz. gelatine. ½ pint water.
1 egg. 1 dessertspoonful sugar.
1 lemon.

Heat the water, lemon juice and rind and sugar, and pour over the gelatine in a basin, and stir till dissolved. Beat up the egg, add strained water, lemon and gelatine, stirring well. Sweeten, and set in prepared moulds.

Floating Island—

½ pint milk. 1 egg. 1 teaspoonful sugar.
2 sheets gelatine. Flavouring.

Soften the gelatine by soaking in cold water. Separate the white and yolk of the egg. Heat the milk and sugar, add to beaten egg yolk. Cook till it thickens slightly, pour on to gelatine, flavour. Divide evenly into 2 glass dishes, and allow to cool. When cold, beat up white of egg stiffly, add a little sugar and place a little on each custard.

Foam Pudding—

Make as Spanish cream, using only one sheet of gelatine to ½ pint of milk.

Rice or Sago Cream—

1 small tablespoonful rice or sago. ½ pint milk.
1 egg. 1 teaspoonful sugar. Vanilla flavouring.

Cook the cereal in the milk in a double saucepan for one hour (or in a saucepan about ½ hour) and add sugar and vanilla. Separate the yolk of the egg, beat and to this add the rice and milk, return to pan and cook for one minute, but do not let it boil. Cool. Fold in stiffly beaten egg white.

CHAPTER III

DISPENSING SPECIAL DIETS

By MARGERY ABRAHAMS, M.A., M.Sc.

NOW that the dietary department has become an integral part of many hospitals, a description of its work may be of interest. It usually serves both in- and out-patients—the dietitian and her staff carrying out the physician's prescriptions for the former, and teaching the latter how to carry out their diets at home. The dietitian must be a good cook if she is to convert the prescription of so many grammes of carbohydrate, protein, and fat, for instance, into palatable and attractively served meals. Her culinary skill will also be valuable in order to teach patients how to prepare their own diets. Dietitians must have a sound knowledge of dietetics and of chemistry and physiology up to B.Sc. or 2nd M.B. standard in order to be able to fulfil dietary prescriptions intelligently. In planning such research diets as, for instance, those for calcium metabolism, dietitians have devised a kitchen routine, the accuracy of which is essential for satisfactory results. After their theoretical training dietitians work for six months in a hospital diet kitchen, and usually spend some weeks in a main kitchen. Although most hospitals do not regard nursing training as essential, it is of the greatest advantage to a dietitian, and in some hospitals student dietitians, if they are not nurses, obtain experience in the wards.

Dietitians work strictly under the medical attendant's orders, and although they may make suggestions on the details of diets, they only prepare them after receiving a quantitative or qualitative prescription. Quantitative prescriptions are calculated according to food tables and the publication by the Medical Research Council of analyses* have made available the results of modern analytical technique for typical raw and cooked English foods.

In a diet kitchen, where large numbers of diets are served, to prevent risk of mistakes it is usually found most convenient to label every weighed portion with its weight, and the name or bed number of the patient, and his ward or room. When only qualitative restrictions are necessary, the dish should be marked "low fat", "low salt", or the like. At St. Bartholomew's Hospital as a further precaution food for diabetics is always sent to the wards in a dish of different colour from that used for sugared or other foods for non-diabetic diets.

Diabetic diets without insulin are usually arranged so that the carbohydrate is evenly distributed between the meals; when ordinary insulin is used, the larger amount of carbohydrate is given in the meals following the dose or doses. If protamine (retard) or protamine zinc insulin is used, the arrangement of carbohydrate is usually made by the physician, since the maximum action of these new insulins is considerably deferred and patients must be treated individually. The maximum action of the protamine insulins takes place from 12 to 24 hours after injection. When they are used extra carbohydrate should be given at tea and bedtime, and in the case of protamine zinc also at the time of the injection.

The foods making up the prescription for a diabetic may

* McCance and Shipp, "Chemistry of Flesh Foods and their Losses on Cooking," 1933. McCance, Widdowson and Shackleton, "The Nutritive Value of Fruits, Vegetables and Nuts," 1936.

have to be considerably modified according to the condition of the patient. Should he have influenza or be recovering from an operation, for instance, a fluid diet may be all he can take at first, whilst the times of insulin, if he takes it, and the amount of carbohydrate must not be varied from the usual quantities. Examples of normal, light and fluid diets containing 150 grammes carbohydrate for use with ordinary insulin taken twice daily are given below (see pp. 52–53). In cases of indigestion the type of food used and the hours of feeds must be modified as indicated. The bulk and cellulose of the diet will have to be reduced, cabbage and lettuce omitted altogether, and stewed or baked apple or orange juice substituted, according to their carbohydrate value, for the usual portions of fruit. This diet would suit a patient with heart disease as he also needs an easily digested diet of small bulk so as to avoid pressure of the stomach on the heart. It may be wise in some cardiac cases to reduce the breakfast by about 10 grammes carbohydrate, say ⅔ oz. of bread, in order to give in the middle of the morning 2 oz. grapes, ½ oz. of unsweetened biscuits, or 7 oz. of milk, to supply the heart muscle with readily available carbohydrate.

When extra exercise such as swimming or tennis is occasionally taken by a diabetic within a few hours of a dose of ordinary insulin, an extra 15 grammes of carbohydrate should be taken. This may be in the form of 7 oz. milk and ¼ oz. of unsweetened biscuit, or 6 oz. of peeled orange.

A child's diet, at any rate until it is sixteen years old, should contain larger amounts of calcium than an adult's if growth is to be normal, and therefore it is usual to include a pint to a pint and a half of milk, supplying about two-thirds of the day's requirement. Diabetic, like other, children should of course take this amount of milk. If a child requires a low-fat diet because of jaundice or cyclical vomiting, care must be

DIABETIC DIETS CONTAINING 150 GRAMMES CARBOHYDRATE

Insulin before Breakfast and Supper.

	Gm.	Oz.	Normal Diet.	C. Gm.	P. Gm.	F. Gm.
Breakfast			One egg		6·8	7·0
	30	1	Bacon, raw weight		3·6	15·3
	60	2	Tomato	1·6	0·6	
	90	3	Bread	45·0	7·2	0·9
	100	3½	Milk in tea or coffee	5·0	3·5	3·9
Mid-morning						
Carbohydrate at breakfast and Mid-morning				51·6		
Dinner	60	2	Meat		14·7	9·3
			Cabbage or other vegetable containing negligible carbohydrate, as much as desired	1·0	0·6	
	120	4	Potatoes	20·0	2·4	
	100	3½	Milk as custard or junket or in coffee	5·0	3·5	3·9
	120	4	Apple or other fruit containing 10 Gm.C.	10·0	0·4	
Carbohydrate at dinner				36·0		
Tea	22	¾	Cheese or one egg		6·8	7·0
	15	½	Bread	7·5	1·2	0·2
	60	2	Tomato (green salad if desired)	1·6	0·6	
	60	2	Milk	2·8	2·0	2·2
Carbohydrate at tea				11·9		
Supper	45	1½	Ham or 2 oz. meat		14·7	9·3
	75	2½	Bread (or ½ oz. bread and 6 ozs. potatoes)	37·5	6·0	0·8
	120	4	Orange or other fruit containing 10 gm.C.	10·0	0·8	
	60	2	Milk in tea or coffee	2·8	2·0	2·2
Bedtime						
Carbohydrate at supper and bedtime				50·3		
	45	1½	Butter all day		0·2	36·3
				149·8	77·6	98·3

Diets adapted from Abrahams & Widdowson, "Modern Dietary Treatment"; by kind permission of Messrs. Baillière, Tindall & Cox.

DIABETIC DIETS CONTAINING 150 GRAMMES CARBOHYDRATE

Insulin before Breakfast and Supper.

	Gm.	Oz.	Diet for Indigestion.	C. Gm.	P. Gm.	F. Gm.	Gm.	Oz.	Light Diet.	C. Gm.
Breakfast -			One egg, boiled or poached - - -		6·8	7·0			One egg, boiled or poached - -	
	60	2	Bread, white - -	30·0	4·8	0·6	30	1	Bread - - -	15·0
	60	2	Milk in weak tea - -	2·8	2·0	2·2	22	¾	Marmalade - -	15·0
							60	2	Milk in weak tea -	2·8
Mid-morning	30	1	Bread, white - -	15·0	2·4	0·3	180	6	Milk - - -	8·4
	100	3½	Warm milk - - -	5·0	3·5	3·9	15	½	Bournvita or Ovaltine	10·0
Carbohydrate at breakfast and Mid-morning -				52·8						51·2
Dinner - -	45	1½	Chicken, rabbit, or sweetbreads - -		11·8	4·6	90	3	Fish if desired - -	
							9	⅓	Rice or tapioca } pudding	8·2
			Cauliflower or sieved spinach, small portion	1·0	1·[illegible]		120	4	Milk - - } pudding	5·6
							7	¼	Glucose - - } pudding	7·0
	90	3	Mashed potato - -	15·0	1·8		90	3	Stewed prunes or mashed potato -	15·0
	180	6	Baked apple (weighed before cooking) -	15·0	0·6					
	100	3½	Milk as custard or junket - - - -	5·0	3·5	3·9				
Carbohydrate at dinner				36·0						35·8
Tea - -	22	¾	Fresh milk or cream cheese or one egg -		6·8	7·0	15	½	Bread - -	7·5
							60	2	Milk in tea - -	2·8
	15	½	Bread, white - -	7·5	1·2	0·2				
	60	2	Milk in weak tea - -	2·8	2·0	2·2				
Carbohydrate at tea				10·3						10·3
Supper -	75	2½	Steamed fish - -		13·5	0·6			One egg boiled, or poached if desired	
	90	3	Mashed potato or 1 oz. white bread - -	15·0	1·8		150	5	Milk } as bread and milk if desired	7·0
	100	3½	Milk } pudding	5·0	3·5	3·9	50	1¾	Bread } as bread and milk if desired	25·0
	9	⅓	Rice or tapioca } pudding	8·2	0·6		5	⅙	Glucose } as bread and milk if desired	5·0
Bed-time -	15	½	Unsweetened biscuits -	10·0	1·7	1·6	15	½	Bournvita or Ovaltine	10·0
	7	¼	Bournvita or Ovaltine -	5·0	0·9	0·6	120	4	Milk - - -	5·6
	150	8	Milk - - - - -	7·0	5·0	5·5				
Carbohydrate at supper and bed-time				50·2						52·6
	45	1½	Butter all day - -		0·2	36·3				
				149·3	75·6	80·4				149·9

DIABETIC DIETS CONTAINING 150 GRAMMES CARBOHYDRATE

Insulin before Breakfast and Supper.

	Gm.	Oz.	Fluid Diet.	C. Gm.	Gm.	Oz.	Child's Diet.	C. Gm.	P. Gm.	F. Gm.
Breakfast -	15	½	Bournvita or Ovaltine	10·0			One egg - - -		6·4	4·0
	150	5	Milk - - -	7·0	52	1¾	Bread - - -	26·3	4·2	0·5
	20	⅔	Glucose or Lactose -	20·0	15	½	Porridge, raw weight, or breakfast cereal	10·0	1·9	1·1
	20	½	Lemonade } Glucose } - -	15·0	100	3½	Milk - -	5·0	3·5	3·6
Mid morning					200	7	Milk (third of a pint)	10·0	7·0	7·7
Carbohydrate	*at*	*bre*	*akfast and Mid-morning*	52·0				51·3		
Dinner -	150	5	Milk as junket or jelly }	7·0	60	2	Meat - - -		15·0	12·2
	7	¼	Glucose - - }	7·0			Cabbage or other vegetable containing negligible carbohydrate, as much as desired - -	1·0	0·6	
	22	¾	Lemonade } Glucose } - -	22·0						
					90	3	Potatoes - - -	15·0	1·8	
					120	4	Apple or other fruit containing 10 Gm.C.	10·0	0·4	
					200	7	Milk as junket or jelly or to drink - -	10·0	7·0	7·7
Carbohydrate	*at*	*dinn*	*er*	36·0				36·0		
Tea - -	7	¼	Glucose - - -	7·0	15	½	Bread - - -	7·5	1·2	0·2
	60	2	Milk in tea - -	2·8	60	2	Milk in weak tea (or 1 oz. orange juice in water) - -	2·8	2·0	2·2
Carbohydrate	*at*	*tea*		9·8				10·3		
Supper -	15	½	Lemonade } Glucose } - -	20·0	45	1½	Cream cheese or two eggs - - -		12·8	8·0
	150	5	One egg } as boiled		60	2	Bread - - -	30·0	4·8	0·6
	10	⅓	Milk } custard or Glucose } ice cream	7·0 10·0			Cress or lettuce, as desired			
					120	4	Orange or other fruit containing 10 gm. C.	10·0	0·8	
					240	8	Milk - - -	11·2	8·0	8·8
Bedtime -	15	½	Bournvita or ovaltine	10·0						
	120	4	Milk - - -	5·6						
Carbohydrate	*at*	*supp*	*er and bedtime*	52·6				51·2		
					30	1	Butter all day - -		0·1	24·2
				150·4				148·8	77·5	81·1

taken to give him $1\frac{1}{2}$ pints skimmed milk, and also some vitamin A and D concentrate to compensate for the deficiencies inevitable owing to the removal of fat from the diet. The dietitian should be sure to arrange diets for children who require them so that they feel as little as possible handicapped amongst their fellows. There is no reason, for instance, why a diabetic child should not have his third of a pint of milk at school calculated as part of his diet, so that he can take it through a straw with his class mates. Whilst he may have ordinary cakes and sweets, the possibility of an "inferiority complex" should be avoided by early making him feel that he is a person with special knowledge of how to keep fit which he shares with tennis players, swimmers, footballers, and other athletes whom boys and girls usually admire.

HIGH CALORIE—LOW RESIDUE DIET

A new adaptation of an old diet is the high calorie, low residue type now used for streptococcal infections treated with sulphanilamide or similar drugs. Medicines containing sulphur must be avoided and some physicians advise the avoidance of eggs and cheese. A high calorie fluid diet for this disease might consist of two-hourly feeds of milk and cream mixtures with various flavourings alternating with strained juices of raw and cooked fruits well sweetened with glucose or lactose to increase the calories, and jellies, junkets, ice creams, or cream or milk soups.

SUITING THE INDIVIDUAL

Diets must always be arranged to suit a patient's normal tastes and habits. It would be as stupid to arrange a high tea for someone accustomed to a late dinner of seven courses, as to order a working man elaborate and unaccustomed dishes, such as souffles or caviare. Dietetic adequacy, however, must

HIGH CALORIE AND LOW RESIDUE DIET
(Low Sulphur)

Meal.	Gm.	Oz.		Calories.
Breakfast -	15	½	Cornflakes, rice crispies, puffed rice, fine oatmeal or patent barley.	56
	30	1	Cream - - - - - -	131
	150	5	Milk in tea or coffee, and with cereal	100
	30	1	Glucose in tea or coffee, and with cereal.	116
	45	1½	Bread, white - - - -	114
	10	⅓	Butter - - - - - - -	75
	30	1	Jelly or honey - - - -	111
Mid-morning	30	1	Lemon juice, well strained } -	232
	60	2	Glucose—water to taste }	
	30	1	Cake, plain or ¾ oz. cream crackers	130
Dinner - -	45	1½	Chicken or rabbit - - -	81
	120	4	Mashed potato - - - - -	100
	15	½	Butter - - - - -	113
	10	⅓	Rice or tapioca } Milk pudding	36
	120	4	Milk - - } Milk pudding	80
	10	⅓	Glucose - } Milk pudding	41
	90	3	Milk in coffee - - - - -	60
	30	1	Cream on pudding, and in coffee -	131
	45	1½	Chocolate - - - - - -	222
Tea - -	60	2	Bread, white - - - - -	152
	15	½	Butter - - - - - -	113
	30	1	Honey or jelly - - - - -	111
	60	2	Milk in tea - - - - - -	40
	15	½	Glucose in tea - - - - -	58
Supper - -	90	3	Steamed haddock - - -	84
	15	½	Butter - - - - - - -	113
	90	3	Mashed potato or 1 oz. bread -	75
	10	⅓	Butter - - - - - - -	75
	150	5	Milk as junket or jelly - - -	100
	10	⅓	Glucose or lactose - - -	41
	30	1	Cream - - - - - -	131
	30	1	Chocolate or toffee - - -	148
Bedtime -	30	1	Lemon juice, well strained } -	232
	60	2	Glucose—water to taste }	
	15	½	Sweet biscuits - - - -	78
			Total calories, 3,474.	3,480

on no account be sacrified to patients' prejudices or poverty. It may be necessary to obtain the almoner's help for an out-patient in order to secure for him foods, such as eggs and milk, which are as necessary to his recovery as the drugs which are so much more readily available. Food habits are exceedingly difficult to change in the majority of adults, and elaborate devices are often necessary to prevent patients from objecting to necessary alterations in diet.

Examples of two nutritionally adequate reducing diets at medium and low cost are given below. The strict insistence on a minimum intake of fat should be noticed, as patients often err by taking even small amounts of extra butter, and are then puzzled by the failure to lose weight. The reason becomes obvious when the high calorie value of butter is realized: that an ounce contains 226 calories, or about a tenth of the daily requirement of large numbers of men or women in sedentary occupations, and a quarter of the whole calorie value of the reducing diet given below. The form of protein is important, as in this case only about 50 grammes are supplied. A good proportion should come from animal sources, such as milk, eggs, meat, fish, and cheese, whereas bread, which gives vegetable protein besides carbohydrate, should not amount to more than 5 oz. in order to keep the calories low. The animal foods will bring with them mineral salts and some vitamins also, and vitamin C will be easily supplied by such low-calorie foods as tomatoes, salads, and lemons and other citrus and raw fruit generally. When patients fail to lose weight adequately on a thousand calorie diet, a satisfactory method of securing reduction is by giving once a week a diet consisting of 100 grammes carbohydrate (just over 400 calories). This can be made up of two average portions of raw fruit (20 grammes carbohydrate), and one unsweetened biscuit weighing $\frac{1}{4}$ oz. (5 grammes carbohydrate) or one portion of fruit

and three biscuits at each of four meals. Unsugared tea or coffee with a little milk, and as much as desired of meat extract, marmite, or other clear soup, unsugared lemon water (saccharine may be used), and salads without dressing will complete the diet.

Low-Calorie Diet: Low Cost.

Breakfast.

One egg, boiled or poached.
Bread, white or brown, two thin slices.
Butter or marmalade or jam, very thinly spread.
Tea or coffee (ground) with milk to taste. No sugar or sweetened condensed milk.

Dinner.

Meat (lean), rabbit, or steamed fish, medium portion.
Gravy without fat or thickening.
Green-leaf vegetables as much as desired.
Fruit, raw or cooked without sugar.

Tea.

Bread, two thin slices
Butter or jam very thinly spread.
Salad and vinegar as desired.
Tea with milk to taste. No sugar or sweetened condensed milk.

Supper.

Cheese, salmon, herring, or kipper, small portion, or
Two eggs boiled or poached, or
White fish or smoked haddock, medium portion.
Bread, one thin slice, or two unsweetened biscuits.
Raw fruit or salad if desired.
Tea or coffee (ground) with milk to taste.

Butter must not exceed ¾ oz. in the day.

Low-Calorie Diet: Moderate Cost.

Breakfast

Fruit, raw. No sugar.
Two eggs (boiled or poached) or grilled kidney, or smoked haddock, or steamed white fish.
Bread, brown or white, two thin slices, toasted if desired.
Butter, jam or marmalade, very thinly spread.
Tea or coffee with milk to taste. No sugar.

Lunch.

Clear soup, tomato juice, grape-fruit or melon. No sugar.

Lean meat, chicken, rabbit, boiled white fish, lobster, crab, as much as desired, or

Two eggs poached or baked with tomato (no fat).

Green-leaf vegetables or salad as much as desired, no mayonnaise or salad oil.

Fruit, raw or cooked without sugar, as much as desired.

Tea.

Bread, brown or white, two thin slices (as sandwiches if desired) with tomato, cucumber, cress or egg and cress, meat extract, or marmite or

Two small plain scones very thinly buttered, or

Four unsweetened biscuits.

Dinner.

As lunch.

Butter must not exceed ¾ oz. in the day.

Adapted from Abrahams and Widdowson, "Modern Dietary Treatment," by kind permission of Messrs. Baillière, Tindall & Cox.

SPECIAL POINTS

By visiting patients in bed, and by gaining out-patients' confidences in discussion, a dietitian should be able to make sure that most diets are taken satisfactorily. Very small changes will often make all the difference in the acceptability of meals. Too little or too much milk will spoil a diabetic's cup of tea. Foods usually disliked should be avoided, and favourites included. The serving of such foods as milk in the way a patient most enjoys them, either as a savoury dish (white soup, e.g.), or as a sweet (pudding or beverage), will go far to secure the enjoyment and good digestion of the diet.

A dietitian should be careful in carrying out the physician's prescription that she produces a diet which is nutritionally satisfactory in all respects. For instance, unless special care is taken the calorie value of low-protein and low-fat diets may be hopelessly inadequate for the maintenance of weight which is usually desired unless the patient is obese. Whilst the gall-

bladder or kidney, for instance, are being spared, the patient may lose weight and strength. In the 50-gramme protein diet at St. Bartholomew's Hospital necessary calories are supplied without adding to the protein by barley sugar, jam, marmalade, sugar in all beverages, good amounts of butter, as well as puddings low in nitrogen. Sometimes the protective foods had been omitted from a diet. Now it is known that in some infections patients require more than in health, it is only in recent years that vitamin C in the form of orange or tomato juice, or medicinally as ascorbic acid, has been added as a routine matter to diets for gastric ulcer and colitis. The prolonged use of low calorie diets in gastric and duodenal ulcer is also losing favour with many authorities, with the result that apart from the medical effect on the patient there is a noticeable improvement in his contentment, and the temptation to break his diet is minimized. Greater attention also is paid to the fluid intake, and to the presence of enough sodium chloride to prevent a serious fall in blood chlorides.

Experience shows how many changes can be made in the same diet, so that with care and skill the four meals which are the landmarks of a patient's day may become a menu of varied dishes that tempt the appetite and materially assist in the cure of disease.

CHAPTER IV

DIET IN THE ACUTE FEVERS

By MAURICE MITMAN, M.D., M.R.C.P., D.P.H.

FOR two thousand years the recognized dietetic practice was to "starve a fever." Graves (1796–1853) was the first heretic. He boldly proclaimed that many patients with continued fever were being starved to death. Rational dietetics—a relatively recent scientific development—has confirmed Graves's view and demonstrated that physicians back to the time of Hippocrates were wrong. In general, however, recent advances in knowledge have tended to endorse empiric practices.

THEORETICAL CONSIDERATIONS

During fever there is increased metabolic activity with a consequent increase in the destruction of tissues and accumulation of the waste products of metabolism. Since the body fires are burning fiercely, it might seem irrational to add fuel in the form of food. The increased combustion is, however, part of the body's fight against the infection. The pyrexia is evidence, not only of a pathological process, but also of the response of the protective mechanism. To douse the fire is not rational therapeutics; nor is the withholding of fuel. The fundamental requirements of a patient with fever are the same as in the healthy person: carbohydrates, fats, proteins, salts, water, and vitamins. The construction of a suitable diet is but the adaptation of the normal to the changed metabolic circumstances. Since the relationship of vitamins to infection has

been the subject of considerable investigation in recent years, it will be considered first. The prophylactic value of vitamins in increasing resistance to infection is an aspect which does not strictly belong to the subject of this article, but is worthy of mention. There is evidence that resistance to infection is reduced in children suffering from an overt deficiency of vitamins A and D; but there is nothing to suggest that specific fevers can be avoided in normal children by the administration of these vitamins above the usual requirements. Both A and D, and more recently C, have been tried in established infections, but up to the present there is no convincing evidence of the value of any of them. Since excess of vitamins above the normal requirements has no proved prophylactic or therapeutic effect in infectious diseases, the only consideration in constructing a suitable fever diet is to ensure the supply of the normal amounts.

Diets in the acute fevers may be grouped into those suitable for almost all acute infections—the general fever diets—and the special diets necessary for certain diseases and their complications. Such special diets are indicated in alimentary infections, e.g. enteric fever, dysentery and infectious enteritis; for the cardiac complications of diphtheria; in certain cases of whooping cough; for the renal disorders complicating scarlet fever; and when the state of the patient is such that normal methods of feeding cannot be employed.

GENERAL FEVER DIET

Every acute infection is accompanied by a varying degree of toxæmia which impairs the activity of all the organs. Although involved in the general toxæmia, the detoxifying and excretory organs, such as the liver and kidneys, are nevertheless called to still greater activity because of the increased tissue

destruction accompanying the rise in the metabolic rate. The digestive and assimilative apparatus is impaired as part of the general disturbance, and there is a diminution in glandular secretions. These changes profoundly influence the types of food which can be taken. The dietetic difficulties are increased by the anorexia and nausea which are common symptoms. A rational fever diet should therefore be acceptable to the dulled palate of the patient, make as little demand as possible on the digestive, assimilative and excretory organs, supply energy for the increased metabolic activities, replace the excessively damaged tissues, maintain the biochemical reactions of the body, and, if possible, assist in the elimination of waste products. There is no convincing evidence that diet influences the infection directly. A suitable diet, however, by maintaining the functional activity of the body, permits the elaborate protective mechanism to operate at its greatest efficiency.

In practice these stringent requirements can seldom be met if the fever is at all severe. Although a patient in bed requires less food than usual, the increased metabolic activity during fever produces a demand for energy considerably above the normal. A man requiring a diet of 3,000 calories a day, when put to bed may manage with 2,000. If he is suffering from a fever his calorie requirements may rise 100 to 200 per cent. Nevertheless, because of his anorexia and impaired digestion he may not be able to tolerate a diet of more than 1,000 calories. If this stage is of short duration he may be able to subsist on this inadequate diet without much harm being done. On the other hand, if the fever is prolonged and the increased demands are not met, there is considerable risk of some degree of starvation. As for the replacement of tissue losses, the difficulty of providing for them is even greater, since the appropriate protein foods are neither acceptable nor suitable: they increase the quantity of nitrogenous waste

products, and many are difficult to digest. A *high carbohydrate diet* "spares" the proteins and is more suitable in the acute stages.

Gauss therefore describes a sequence of three stages in fever diets :—

(1) *The onset diet*, intended to be of short duration, and suitable for the initial stages of fever. It is based on the principle of relative intestinal rest by the prescription of easily digested foods, but the calorie value is low.

(2) *The continuation diet*, in which the calorie value is increased, but the principle of relative rest to the digestive apparatus is maintained. It is continued for as long as the fever persists. In diseases with continued pyrexia, e.g. typhoid fever, this stage is of the utmost dietetic importance. It may be described as rest without starvation, and in this respect is a departure from the practice of two thousand years.

(3) *The recovery diet* is intended to make up the losses of the two previous stages, and is constructed with a high calorie and high protein content.

In most of the common infectious diseases the initial pyrexia is of short duration, seldom lasting for more than a few days. In these diseases the transition through the three stages takes place rapidly. In the mild diseases such as rubella and chicken-pox, and even in the mildest forms of scarlet fever and diphtheria, the disturbance to the patient is so slight that the initial stage can frequently be omitted. Except for the special diseases and complications mentioned above, the general fever diet is suitable for all the infectious diseases. To the practitioner of experience, the following guiding principles for choosing a diet may appear platitudinous, but the frequency with which they are disregarded is surprising.

(1) As an extension of the principle of relative digestive rest, small feeds at frequent intervals should be prescribed.

(2) Since the requirements of the body are not fully met in the first two stages of the fever diet, the return to the normal diet should take place as soon as possible.

(3) The appetite of the patient is one of the best guides to the quantity of food the patient will tolerate, the intervals at which feeds can be taken, and the time for transition from one stage of the diet to the next. This is so even in children (who constitute a high percentage of patients with fevers), although for them the practitioner may justifiably regulate the diet more rigidly. Nevertheless, to deny a hungry child an increase in diet because some pyrexia persists, is an error of judgment. The young house officer is a much greater offender in this respect than the general practitioner or the nurse.

(4) Monotony in the prescribed diet is a definite imperfection. The practitioner should be thoroughly familiar with the various types of food suitable for the various stages of fever. Within these limits the tastes and dietetic habits of the patient are the best guide to the selection of suitable constituents. The habits of an adult cannot be changed in a day. It is both unnecessary and undesirable to impose a diet of milk and rice pudding on an individual who abhors these foods. A patient accustomed to alcohol should not be forbidden an occasional drink, nor should a child be denied a boiled sweet or a piece of chocolate, as, apart from their attractive taste, they possess definite food value.

THE ONSET DIET—The primary consideration of the onset diet is to supply the most easily digested and assimilable foods. Although the calorie content will be well below requirements, the maximum amount which can be tolerated should be

included. Furthermore, those articles of diet which leave an alkaline residue on combustion are useful for counteracting the "acidity" which accompanies pyrexial conditions. Carbohydrates, to supply energy, should be included. In practice this means a fluid or soft diet containing variations of the following articles of diet: water, milk, sugar, eggs, cereals, and fruit juice.

Water.—About four-fifths of the body weight consist of water, and all the essential biochemical reactions take place in this fluid. During fever water is necessary for allaying thirst, making up the excessive losses, flushing the excretory organs, and assisting in the heat regulation of the body. The maximum amount which the patient will tolerate is therefore indicated, but forcing fluids is rarely desirable. To provide variety, and render it more palatable, water may be flavoured in various ways (lemonade, orangeade, barley water, "aerated" waters), or given in the form of broths, clear soups or beverages (tea, coffee, chocolate, cocoa). These alternatives, particularly those made up with milk and sugar or fresh fruit juices, contain other useful constituents, but their essential value lies in their water content. All the rest of the articles in the onset diet are liquid or soft foods, which, although containing water, are given primarily for their food content. Fluids may be taken cold, iced, or at room temperature. There appears to be some therapeutic value in hot drinks; and iced drinks are particularly acceptable to patients with pyrexia.

Milk.—Since milk contains all the essential ingredients of a diet, it is a complete food in itself; and as it is readily digested, it occupies first place as an article of diet in fevers. It loses vitamins during heating and pasteurization, but this deficiency can readily be made up. To avoid monotony milk modifications may be used. Malted milk, milk flavoured with tea, coffee, chocolate or cocoa, ovaltine, milk shakes, butter-milk,

junket, ice-cream, custards, are examples. Some adults, and a few children, dislike milk. For the adult with a taste for alcohol, milk punch, containing whisky or sherry, may increase palatability. In some patients with alimentary disorders, and particularly in children, whole milk is not well tolerated. Modifications may be made by the removal of certain constituents, as in evaporated milk, sweetened condensed milk, skimmed milk, whey, and homogenized milk.

Sugars.—The chief function of carbohydrates is to supply energy for the body. They are readily digested and assimilated, and most of them, particularly the pure sugars, are pleasant to take. They are therefore valuable as fuel for the increased metabolism accompanying the acute fevers. It is essential that important organs, such as the heart, should not lack adequate food during their enforced hyperactivity under toxic conditions. Glucose has therefore been given a therapeutic importance and is administered, not only in food, but also intravenously and per rectum. It is likely that glucose has some value, other than its food value, in toxic states. For a pure sugar ingredient of the diet, the practitioner will depend largely upon ordinary cane or beet sugar. Syrup and honey are pleasant alternatives. For children (and not for them alone) boiled sweets, barley sugar, and chocolate are pleasant forms of sucrose.

Cereal foods consist largely of carbohydrates (mostly starches), but with smaller amounts of other constituents. Bread, toast, biscuits and cake are the most important varieties. Cereal gruels, made from wheat, rice, barley and oatmeal, have had a long usage, both in the home and in hospitals, as an invalid food.

Fruit juices are most suitable as constituents of the fever diet. They contain carbohydrates and vitamins. Their acid taste is pleasant and refreshing to the mouth. Some fruit juices

contain acids which leave an alkaline ash, and those containing citric acid, such as oranges, lemons, grape-fruit and tomatoes, are particularly useful. Purées of apples, prunes, peaches and pears may be employed as adjuncts to the soft diet.

Eggs are a useful article of diet because they supply protein and fat in a palatable and readily digestible form, and contain vitamins. When fat is not tolerated, the white only may be employed. Added to fluids, such as lemonade and milk, egg white or whole egg reinforces the purely liquid diet. Soft-boiled, scrambled and poached eggs, and omelettes are introduced a little later, when the fluid diet gives place to the soft diet.

It will be obvious that in the onset diet the chief consideration is the provision of carbohydrates. Proteins and fats are present in some of the foods supplied at this stage, but articles of diet containing them in relatively high proportions are not suitable. Meats, green vegetables and foods difficult to digest because of their mode of preparation are contra-indicated. Fried, baked, roasted and grilled foods are unsuitable. In the soft diet mashed potatoes are useful for their carbohydrate content and purées of legumes, such as peas, beans and lentils, for their nitrogenous constituents.

In the examples of diets given below, fluids may be given *ad lib.*: water, barley water, orangeade, sweetened lemonade, "aerated" waters.

ONSET DIET FOR A CHILD

7 a.m.	Milk.
9 a.m.	Fruit juices (sweetened orange or grape-fruit).
12 noon	Malted milk, or egg in milk.
3 p.m.	Milk flavoured with tea or chocolate. Ice-cream
6 p.m.	Hot milk or cocoa.

ONSET DIET FOR OLDER CHILD OR ADULT

7 a.m.	Tea and biscuit, or fruit juice.
9 a.m.	Hot milk, or milk shake, or ovaltine, or milk flavoured with coffee.

12 noon Malted milk, or egg in milk, or gruel and cream.
3 p.m. Fruit juice, or tea and finger of toast.
6 p.m. Broth reinforced with egg, or malted milk flavoured with chocolate, or gruel, or junket.
10 p.m. Hot milk, or cocoa, or ovaltine, or egg lemonade, or weak Russian tea with slice of lemon.

CONTINUATION DIET.—As soon as possible, and seldom longer than twenty-four to forty-eight hours after the onset, the purely fluid diet should be replaced by the soft diet.

CONTINUATION DIET FOR A CHILD

7 a.m. Milk, or malted milk and biscuit.
9 a.m. Fruit juice and egg white, or ice-cream and boiled sweet.
12 noon Mashed potatoes and gravy, or gruel.
Milk pudding and syrup, or milk pudding and apple purée, or bread pudding, or jelly.
3 p.m. Milk flavoured with tea or chocolate.
Bread and butter and jam.
6 p.m. Soft-boiled egg.
Piece of chocolate.

CONTINUATION DIET FOR OLDER CHILD OR ADULT

7 a.m. Tea and biscuit, or fruit juice.
9 a.m. Egg (boiled, poached or scrambled).
Toast and butter.
Milk, tea, or coffee.
12 noon Chicken broth with rice, or cream of tomato.
Toast.
Vegetable purée.
Baked custard, or milk pudding and syrup, or milk pudding and stewed apple.
3 p.m. Tea, bread and butter, jam.
6 p.m. Malted milk, or egg in milk, or boiled egg.
10 p.m. Ovaltine.

CONTINUATION DIET FOR ADULT

8 a.m. Fruit juice.
Rolls and butter, or cereal food (puffed rice or wheat, quaker oats, or shredded wheat).
Coffee or tea.
10 a.m. Hot milk, or milk shake.
12 noon Poached egg on mashed potato or on toast.
Hot milk, or tea.
4 p.m. Ice-cream and wafers.
7 p.m. Gruel and cream, or cream soup and toast.
Milk pudding, or junket, or custard, or chocolate pudding.

Banana, or apple purée and cream.
Coffee.
10 p.m. Cocoa.

RESTORATION DIET.—The object is to make up losses sustained in the earlier stages, and here particularly the patient's tastes should be considered. Adults usually fall into one of two groups: those whose appetite increases as the day goes on, so that the best meal is taken in the evening, and those whose appetite is best in the first half of the day. Children tend to belong to the second group. The patient should be consulted as to whether his main meal is luncheon, dinner or high tea, and the diet constructed accordingly. Although restrictions are relaxed at this stage, some gradation is desirable. In introducing flesh foods, it is better to start off with fish, fowl, rabbit, or tripe, and leave those more difficult to digest, such as pork, beef, veal and mutton, until later.

The following are examples of early restoration diets:—

RESTORATION DIET—MID-DAY DINNER

Breakfast—
Grape-fruit, or fruit juice.
Porridge with cream, or cereal food and cream.
Eggs (2), or fish.
Toast and butter.
Coffee or tea.
10 a.m. Milk, or malted milk or coffee.

Mid-day dinner—
Soup, thick or clear.
Fish, or chicken, or rabbit, or tripe.
Potatoes.
Legumes, or green vegetables.
Sweet, or pudding, or fruit with cream and custard.
Coffee.

Tea—
Tea.
Bread and butter, or biscuits, or cake, or sandwiches.
Honey or jam.

Supper—
Eggs (2) (boiled, poached or scrambled), or omelette, or fish, or stew.

Fruit, or sweet, or ice.
Cocoa, or tea, or coffee.

RESTORATION DIET—EVENING DINNER

Breakfast—
Fruit juice or stewed fruit.
Rolls and butter.
Honey.
Coffee.

10 a.m. Milk, or malted milk, or coffee.

Luncheon—
Fish, or omelette, or cold chicken and green salad, or salmon mayonnaise.
Sweet, or fruit and cream, or cheese and celery.
Coffee or tea.

Tea—
Tea.
Bread and butter, or biscuits, or sandwiches, or cakes.
Jam or honey.

Dinner—
Grape-fruit.
Soup, thick or clear, vegetable or meat.
Fish, steamed or boiled.
Chicken, or rabbit, or tripe.
Potatoes.
Legumes (peas, beans, lentils), or green vegetables (cabbage, sprouts, artichokes), or asparagus.
Sweet or fruit.
Coffee.

SPECIAL DIETS

If fever is due to an intestinal infection, an additional principle is involved. Since the bowel is inflamed, not only must the food be readily digestible, but also the residue must be of such quality and quantity as to produce as little irritation as possible. In low-residue diets those articles producing "roughage" must be eliminated, e.g. whole-meal bread, unpolished cereals, green vegetables, nuts, most fruits and meats. The soft diets described above are usually suitable, but even in these there are constituents which may prove irritating. It is essential, therefore, to watch the stools and note their frequency, so that unsuitable constituents may be eliminated

from the diet. Children with infectious diarrhœa constitute a special class of intestinal infections. Milk in an unmodified form is often unsuitable for them. The difficulty may be with fat, or protein, or carbohydrate, and modifications to decrease the amount of the unsuitable constituent can be made. When all the constituents are not tolerated the difficulty is greater.

Mention should be made of a diet, composed solely of raw bananas or apples, which has been tried extensively in recent years for alimentary disorders. Successes have been reported, and attempts made to find a rational basis for the diet which, in view of the old objections to raw fruit, would seem theoretically unsound.

Typhoid fever is an excellent example of the type of alimentary infection demanding special dietetic consideration. As a result of the toxæmia, alimentary disorder, and continued fever, the destruction of tissues and wasting of the body may be serious and the danger of semi-starvation by an inadequate diet considerable. The day of the milk diet has passed: it does not supply enough nourishment, and may cause discomfort. Coleman has been the chief advocate of a high calorie diet. By suitable gradation and, if necessary, by persuasion, the calorie content can be brought up to as much as 4,000 to 5,500 calories a day in the second week. Semi-solid foods with little residue, similar to those in the continuation diets already described, form the basis of the typhoid diet. Additional protein is necessary and eggs (six to twelve a day), purées of legumes, and later fish, chicken and cheese, are useful. Lactose has been extensively advocated as a suitable sugar and is well tolerated.

In *whooping cough*, although the patient may be apyrexial, the vomiting which frequently accompanies the whoop may deprive the patient of considerable nourishment. Frequent, small, nourishing feeds, with as high a calorie content as

possible, are necessary. It is a useful rule to give milk or one of the small feeds after a paroxysm.

In *scarlet fever* the complication which demands special consideration is nephritis, which usually occurs in the third week of the disease. In an ordinary case there is no necessity to modify the acute fever diet in the hope of preventing nephritis; but as soon as there is evidence of involvement of the kidneys, modification of the diet is essential. The complication is an acute inflammation of the kidneys, demanding the usual restrictions of proteins and salts. The old practice of forcing fluids should be deprecated. The intake should be regulated by comparison with the output. The milder forms of inflammation, in which the only sign is albuminuria, require less rigorous restrictions.

In severe *diphtheria*, cardiovascular failure and paralysis of the palate and pharynx may demand modifications in the acute fever diet. After the first week, vomiting is a serious symptom, and demands partial or complete rest of the stomach. The practitioner must therefore be content to supply what nourishment he can by rectal feeding or intravenous glucose and saline. The paralysis of the upper alimentary tract interferes with swallowing. In the milder cases semi-solid foods can be taken, but fluids are regurgitated into the nose. In the more severe cases it is necessary to resort to nasal or rectal feeding. These methods of feeding are, of course, essential in diseases producing unconsciousness e.g. in some cases of cerebrospinal meningitis and encephalitis epidemica. Adequate nourishment cannot be supplied by these means. In rectal and intravenous "feeding" only water, salt and glucose can be given. Nevertheless they defer that starvation which it has been the chief object of this article to condemn.

CHAPTER V

DIET IN PULMONARY TUBERCULOSIS

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AND

GEORGE DAY, M.D.

THE science of dieting in tuberculosis is mostly empirical. Only in exceptional (i.e. experimental) circumstances can there be any controls. The one witness to the body-building power of food, namely the weighing-machine, is apt to prove deceptive. In some weeks a great number of the inmates of a sanatorium will gain weight prodigiously. In other weeks a majority will drop and the most careful analysis of the diet supplied during these periods does not reveal any causal factor. Any experimental observations would have to be carried out continuously over a period of at least two months; and long before that time was up patients in Group A, fed exclusively on the scientific diet (composed as it is apt to be of a handful of lentils, two buttered dates and a raw carrot three times a day) would be committing robbery with violence on the control Group B. A patient undergoing pulmonary collapse therapy may lose weight continuously—although doing well in every other way—until he settles at a weight which will be his normal for some time to come.

HISTORICAL

Hippocrates (*circa* 400 B.C.) decided once and for all (apparently) that milk was beneficial "when there is no high fever."

For the more acute cases he prescribed white wines, barley water and honey. John Mirfield (*circa* A.D. 1400) advanced the claims of river crab and sugar of roses: both of which are sadly neglected nowadays. In fact, milk is the only relic of mediævalism extant. For growing infants it appears to be an admirably balanced food in a dilution suited to their relatively large stomachs. Bedridden adults requiring the minimum of 3,000 calories would have to accommodate 7½ pints a day and ambulant patients probably double that amount. Even with this bulk it is unlikely that they would increase their body-weight. Custom dies hard and it is still given more in cowardice than in hope as an "extra." Perhaps it has some catalytic action on other food-stuffs ingested, as patients who are tending to become too gross certainly lose this tendency when their daily pint of milk is cut off.

The first experiment on a large scale was made by the late Otto Walther of Nordrach who maintained that, if only a patient could eat and sleep, no matter how ill he might be, he would be able to get well. "Stuffing" was the order of that era. He taught his patients not to be fastidious about their food, but to eat whatever was put before them; and to finish their meals however nauseating they were and however poor their appetites. In almost all cases he gave ordinary solid food with no choice of dishes. Milk was given nearly always with meals and nothing was allowed between meals; there were just three square—nay, cubic—meals a day. If patients vomited, they had to start all over again. The principle was—stuff the food down and it will be digested all right. Such treatment was drastic, particularly for those patients who were fastidious eaters or who suffered from indigestion. But certainly many patients gravely ill, even those with indigestion, were cured both of their indigestion and of their lung trouble. Nowadays this teaching has been modified almost out of recognition. On

the other hand, the practice of resting *before* meals which also emanated originally from Walther has been followed in all British sanatoria; and it undoubtedly aids the tackling and assimilation of food. The body seems all the better able to receive the food and digest it, if a thorough rest has been taken before the meal.

RATIONALE OF MODERN PRACTICE

Food, if it is to fulfil its various functions, must be pleasant, varied and satisfying. It must also be adequate to maintain body-weight or to allow lost body-weight to be regained. Experience goes to show that ordinary full diet suits the average patient and various modifications of full diet are made to suit the individual requirements of each patient. By full diet is meant :—

BREAKFAST (English variety) 8.30 a.m., i.e. fruit, cereal, fish and/or egg and bacon dish, coffee or tea, toast and marmalade or honey.

LUNCH 1.15 p.m.—A meat dish (with a reasonable choice), and two vegetables, sweet and cheese.

DINNER 7.0 p.m.—Soup, fish, meat, sweet, cheese and fresh fruit or savoury.

It is important that these dishes should consist of good food, attractively presented and with as much variety as possible. It must always be borne in mind that meals are the three important events in a bed-patient's day, and that as he has done nothing whatever to deserve them and as he eats with a great attention to detail, they must be worthy of intense scrutiny. The old school tradition of—Sunday, sausages; Monday, fish cakes; Tuesday, eggs—would speedily bring trouble!

It goes without saying that the times of the meals should roughly coincide with those customary to the class of patient under treatment.

Afternoon tea at 3.45 p.m. is accompanied by the minimal amount of bread and butter or cake so as not to "spoil the

dinner." It cannot be eliminated entirely as it is the one meal which patients can take with relatives or friends during afternoon visiting hours.

COMMON MISTAKES

Indications for departure from full diet are rare. In regulating the diet in tuberculosis the three commonest mistakes are:—

(1) *Too great and prolonged restriction (a) in cases with high fever, and (b) in cases of recent hæmoptysis.* (*a*) With fever the appetite is rarely blunted and the digestion only slightly weakened, and when there is an abundance of cold fresh air about the sick room—as there should be in the case of pulmonary tuberculosis—appetite as well as digestion may be improved considerably. There must be a sufficient amount of food to compensate for a rise of 7 per cent. in the basal metabolic rate with every increase of 1° F. in the temperature of the body. Moreover, lost body-weight can be regained even while the patient is feverish. (*b*) It is generally unnecessary to curtail the diet appreciably in the case of hæmoptysis and it is quite wrong to keep a patient on short commons for days and days. Twenty-four hours on milk and ice-cream are usually sufficient.

(2) *Allowing the patient to overfeed.*—In these days when the importance of rest has been well emphasized and usually carried out properly, it is essential that when the patient is able to begin to get about he should not be too much above his normal body-weight. After he begins to exert himself and gently resumes his more normal activity he generally increases his body-weight further. If at first he is not only flabby but fat, then he is more liable to be short of breath, have a fast pulse and find it all the more difficult to get on to his feet. As Burton-Fanning pointed out years ago one cause of an unduly rapid pulse in a case of pulmonary tuberculosis, which

is apparently getting on very well, is an undue prolongation of the administration of milk.

(3) *Neglect to see that the patient is taking enough fluid, especially when he is feverish.*—A close watch must be kept on the stomach. If a patient becomes bilious and has a furred tongue with offensive breath, lack of appetite, and perhaps a little diarrhœa, it is often a good plan to prescribe a day or two's starvation and increase the fluid intake, giving nothing but milk and barley water. In any case, any symptoms of this sort are best met in advance by seeing whether the patient is taking too much food of one sort or another.

SPECIAL COMPLAINTS

Dyspepsia is quite a common complaint among the tuberculous. An almost normal sequence of events is that a patient leaves an active existence to lie in bed when he comes to a sanatorium. In spite of the advice of his physicians, he has an almost ineradicable belief that it is his duty to stuff himself. He over-eats and develops flatulent dyspepsia—with the fear that "the disease has spread to his stomach." He has to learn what to eat (i.e. what is necessary for his bodily requirements and no more) and how to eat it. Flatulent dyspepsia may be prevented by instructing him first and foremost to rest well before his meals, and secondly to eat dry—to drink freely between meals but not *at* meals. Heartburn at night is another most distressing symptom and may be avoided by progressively diminishing the amount of fluid taken later than the midday meal.

Extreme cachexia.—An emaciated patient will generally regain his body-weight at a reasonable speed (i.e. about $1\frac{1}{2}$-4 lb. a month according to his size) if he is put on full diet. Occasionally there is such severe toxæmia that the whole alimentary system is sluggish. There may be achlorhydria or a catarrhal gastritis caused or enhanced by swallowed sputum.

This is most often present in the early morning when 30 grains of bicarbonate of sodium in a tumbler of hot water or the Brompton Hospital "hot-water mixture" will often clear the way for a good breakfast.

EXTRAS

Fats.—The full diet contains all the fats and fat-soluble vitamins necessary. In fact it is being doubted if fats *per se* have any specific value in tuberculosis apart from their inherent vitamins. Fats may inhibit gastric secretion in a patient who is already hypochlorhydric. Jack Sprat could eat no fat probably for the good reason that it interfered with his digestive processes. Paradoxically enough, patients on a high-fat low-carbohydrate diet put on far less fat than those on a high-carbohydrate low-fat diet.

Proteins are said to increase the respiratory activity more than fats or carbohydrates do. This seems to be an argument against excessive meat-eating, though there seems to be little doubt that purines are definitely beneficial for digestion, and that to begin a meal with a small helping of clear fragrant soup is the most elegant gastronomic prescription.

Carbohydrates in excess definitely cause an increased rate of body-building and this increased rate very often seems to coincide with a decreased destructiveness of the disease process as witnessed by the decline of the sedimentation rate. The high-caloric diet combined with insulin is the best method of increasing the carbohydrate intake. There is nothing like hyperinsulinism to endow the victim with the real famished feeling. Insulin injected in the correct dosage and the injection timed to a nicety make the patient watch his door impatiently as the food-trolley rattles down the corridor. The practice at Mundesley is to give 60 units in the twenty-four hours in six injections of 10 units. Three of these are given between twenty and thirty minutes before the three

main meals are served—twenty minutes is too short an interval for some patients and yet others in half an hour will suffer some of the profound disturbances from the induced hypoglycæmia. Three other injections are given at 11 a.m., 1.45 p.m. and 8.15 p.m., followed each time in half an hour by 6 oz. of fruit drink made of orange and lemon juice with sugar; (½ pint orange juice, lemon juice to taste, ¾lb. granulated sugar, water up to 2¼ pints). The full diet is necessarily modified in respect of carbohydrates and the resulting diet is the ordinary high caloric diet based upon the researches of H. Himsworth of University College Hospital.

In the *high caloric diet* :—

Breakfast is the normal English breakfast, *lunch* must include stewed dried fruit or banana with sugar and a cereal made with milk. At *afternoon tea* the patient is given an extra allowance of bread and butter and jam. At *supper* the soup is thickened with flour or milk and extra bread is given. The caloric value of this diet is about 4,000.

The results of this regime are astonishing. Appended are two typical weight and sedimentation-rate charts showing how the process of regaining weight which had been progressing very slowly was accelerated by the insulin regime, and how *pari passu* the sedimentation rate improved. Of all recently devised adjuvants to the treatment of tuberculosis this high-carbohydrate and low-fat diet with insulin is proving successful with the most gratifying regularity, and there seems to be no reason why it should not be employed by private practitioners who are forced by circumstances to treat tuberculous patients in their own homes while awaiting admission to sanatoria. The patients may just as well pass their time regaining lost body-weight as undergoing treatment which is purely expectant. The diet is such that any moderately intelligent housewife can produce, the glucose

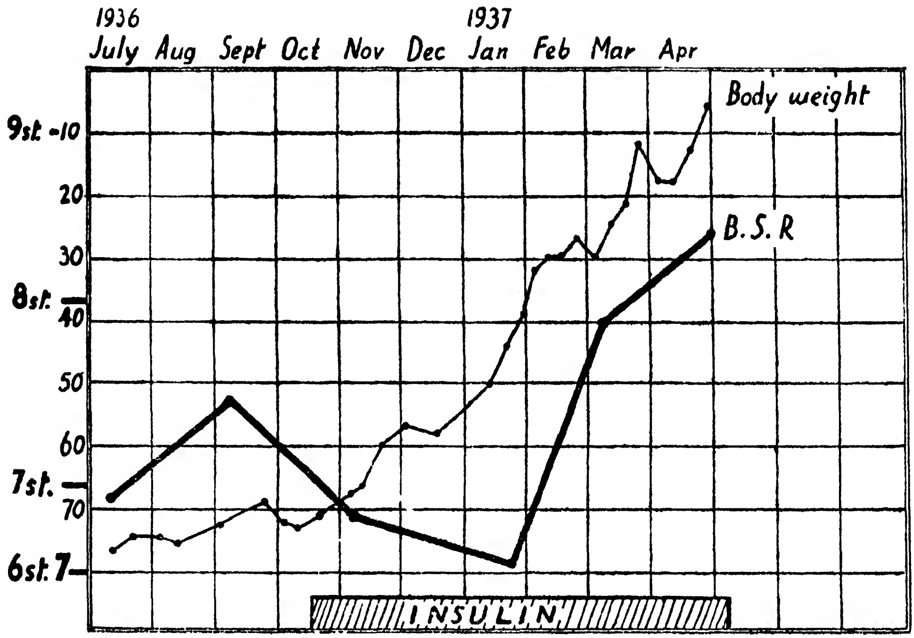

Chart 1.

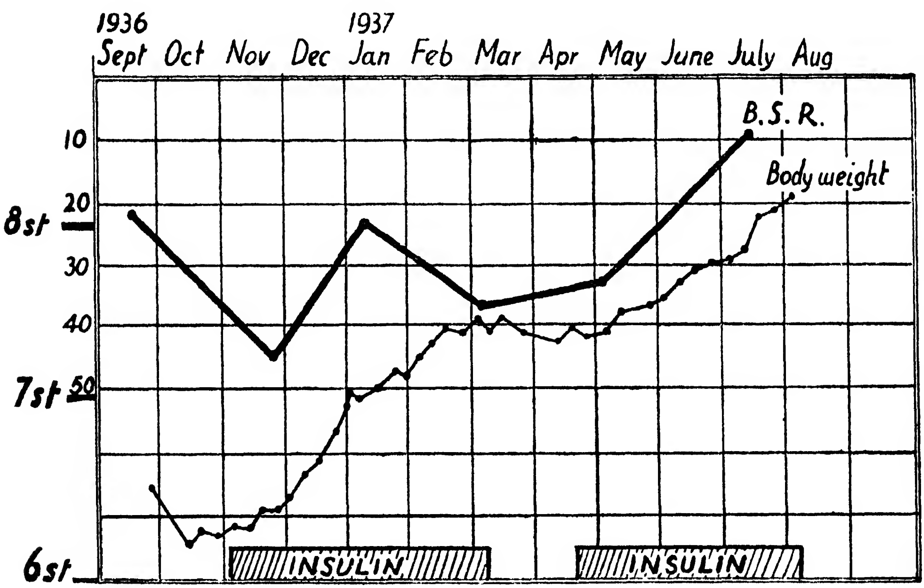

Chart 2.

drink is simple to make and the daily half-dozen insulin injections can be administered by any responsible person.

There seem to be no contra-indications, but certain patients become intolerant—or sensitive—to insulin and show it by developing urticarial reactions. There is no foretelling this reaction. In one case it occurred within thirty-six hours of the first injection and in others after the course had been in operation for several months. Almost invariably warning is given a day or two before by the appearance of weals at the sites of the more recent injections. Then is the time to watch and proceed cautiously. If the weals increase and appear elsewhere, the course should be stopped until the patient is desensitized. Desensitization is performed by repeated intradermal injections of minute doses—exactly as in protein-desensitization.

Transient urticaria (although doubtless of more importance in private practice than in sanatorium practice) is after all a small price to pay and is well worth risking to obtain benefits otherwise denied.

The only other untoward manifestations are those due to hypoglycæmia. The patient soon learns to fly to his bottle of barley sugar or to his glucose drink—which should always be by the bedside—at the first sign of cold-sweat, sinking feeling or tremor and thus to banish it in a very few minutes. The most alarming manifestation of hypoglycæmia is a temporary loss of emotional control. This is comparatively rare and generally occurs at night. The patient feels an irrational impulse to sob, howl and throw things about. Sometimes self-control breaks down and the patient does these things, knowing the whole time that he is making an ass of himself and yet unable to stop it. Glucose speedily averts an attack and recurrence is made improbable by henceforward omitting the 8.15 p.m. injection of insulin.

Warning.—Since the above was written the hypoglycæmic attacks of two of our patients have exhibited all the peculiarities of "fugue states." There have been no prodromal symptoms, the patient's behaviour and conversation are slightly unusual, and the attack ends suddenly leaving the patient momentarily disorientated in both time and place. His memory ends abruptly at the point where the attack began and nothing that transpired during the attack can be brought back into memory. This sort of accident is most undesirable in general practice.

VITAMINS

The full diet has adequate vitamins for the normal healthy man. For a century excess of vitamins A and D has been provided in the form of cod-liver oil—or more recently as adexolin, radiostoleum or haliverol for tuberculous patients; and although there is no clinical test for deficiency or saturation, it appears to be a satisfactory empirical procedure—especially in the winter months when ultra-violet deficiency prevents the body from forming its own vitamin D. Lately some doubt has been expressed as to whether or not the tuberculous patient does not require more vitamin C. The researches of Abbasy, Harris and Ellman (1937), which we have confirmed, show that the patient with active tuberculosis requires to take much more anti-scorbutic vitamins before it can be detected in his urine; and Radford, de Savitsch and Sweeney of America (1937) showed that patients saturated with the ascorbic acid make more rapid progress in every way for at least the first six months of treatment than other controls. It is true that in this series the controls caught up the subjects in nine months, but the fact that the rate of progress was accelerated for the earlier months suggests that it is worth while to give patients with active

disease the juice of two oranges a day or its equivalent of ascorbic acid in the form of "redoxon" tablets.

STIMULANTS

There are various methods of stimulating patients to enjoy their ordinary diet: i.e. light ales or stout served with the meal or occasionally as "elevenses" and sometimes a lemonade made with acid. nitro-hydrochloric. dil. with lemon or orange flavour in a tumbler of water. Certain insipid egg dishes can be made savoury and appetizing by the addition of bovril or marmite.

Alcohol.—As indicated above, light wines, beers or stouts may occasionally be useful, but heavy wines or spirits should be completely forbidden. The tired healthy man confronted with a distasteful social ordeal can on occasion fortify himself with a brace of sherries or a whisky and soda. The tuberculous patient must always regard his tiredness as a first charge that must be met with rest: he must not overdraw on imaginary reserves created by Bacchus.

Smoking after meals is said to assist digestion and has that at least in its favour. Cigarette smoking causes a temporary rise in blood sugar and if indulged in before a meal will blunt the appetite—a fact used some years ago in the advertisements of a certain brand of cigarette when the slimming craze was at its height. Therefore there should be no smoking for an hour before a meal.

TUBERCULOUS ENTERITIS

There is much controversy about the correct diet to be given when tuberculous enteritis is diagnosed—and no wonder—for all suggested modifications have been tried and found more or less disappointing. Two facts, however, emerge: First, that roughage should be cut down to a minimum (i.e. all vegetables should be sieved and no porridge, fr[illegible] or skins allowed),

and second, that milk is rarely tolerated, being apt to cause painful and offensive diarrhœa. It is often given because of its high calcium content, but calcium can be given in far larger doses by the intravenous route. The diet is best kept full and dry with the addition of an ounce of tomato juice and cod-liver oil taken with the meals.

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CHAPTER VI

DIET IN GASTRIC DISEASES

By MAURICE E. SHAW, D.M., F.R.C.P.

THE treatment of gastric disorders by diet was first placed on a scientific basis in 1833 by the publication of Beaumont's famous *Experiments and Observations*. This was followed, half a century later, by Pavlov's classical work which has pointed the way to all further additions to knowledge on the effects of the gastric juices on food-stuffs and the effects of different foods on the motor and secretory functions of the stomach. But, in spite of the enormous increase in knowledge of these subjects in the last hundred years, it is doubtful if modern practice is always either sound in theory or as effective as it might be in its application.

It is natural that patients should feel that they know a good deal about the way their stomachs behave in relation to the food that they put into them. Indeed, it must be admitted that no one can know better than the patient what food agrees with him. But the cause of any disagreement is often quite wrongly attributed to the so-called "indigestibility" of the food in question. The digestibility of food presumably means the extent to which it is broken down in the stomach and intestines into the simple chemical components which are capable of absorption. Failure of this process is not commonly a cause of indigestion; and some of the most completely indigestible foods are those which ha[illegible]greatest reputation

in certain alimentary disorders. The cellulose of green vegetables and the bran of wholemeal bread are certainly completely indigestible as far as the stomach and upper alimentary canal are concerned. But it is rare to hear these accused of causing symptoms of indigestion, whereas pork and lobster, which are quite easily broken down, are the traditional precursors of nightmares and painful dyspepsias.

In considering the diet suitable for stomach disorders it is important to remember that most, if not all, gastric pain is an expression of disturbance of motor rather than of secretory function. Even non-painful sensations, such as nausea and flatulence, can be shown to be connected with changes in the tone or posture of the gastric musculature rather than with alterations in the nature of the gastric secretions. Hyperacidity and acid dyspepsia are terms which are still frequently heard; but they have little justification in the light of modern knowledge. The mucosa of the stomach is not provided with any sensory mechanism capable of distinguishing differences in the degree of acidity of the gastric juice; on the other hand, alterations in tension of the muscular wall are quickly converted into sensations, both painful and otherwise.

The above remarks should make it clear that the mechanics of a gastric diet may be more important than its chemistry, and that the quantity and frequency of the meals may be of far greater consequence than their composition. On the other hand, it must not be forgotten that a diet is designed for two purposes: to relieve the symptoms and to promote cure of the disease. The very fact that the mucous membrane of the stomach is insensitive to ordinary stimuli makes it possible for a diet to be both comforting to the patient and aggravating to his disease.

[illegible]AL PRINCIPLES

Fortunately the d[illegible]eases of the stomach are few. Peptic

ulcer and malignant disease account for the majority; and gastritis which, after a period of eclipse, has once more emerged upon the diagnostic horizon, covers practically all the remainder apart from an occasional rarity such as syphilitic tuberculosis or phlegmonous gastritis. Certain general principles can be applied to the construction of diets for all these conditions. They must be free from mechanical or chemical irritants. When acid is likely to prevent or retard healing they should contain substances which discourage secretion—e.g. fats. When acid is absent as the result of the disease they should include such substances as will stimulate secretion. In all cases meals should be regular in time and moderate in quantity. Gastric diets should be adequate in their content of the three essential varieties of food-stuffs as well as in vitamins.

There is perhaps no more important observation to be made on a patient who is on a diet than the weekly weight —and yet even in hospital it is frequently omitted. In all cases of peptic ulcer the weight should increase slightly under treatment; it should never fall. In other conditions the physician should be guided by the general condition of the patient. An obese alcoholic with a chronic gastritis may reasonably be allowed to lose a little. But in nearly all patients of average weight any loss should be an indication either that the diagnosis requires revision (as when the dyspepsia is a complication of early tuberculosis or Graves's disease) or that the diet is insufficient.

The same general principles should be applied in constructing diets for the so-called functional diseases of the stomach although, if the absence of organic disease can be confidently assumed, a wider latitude may be allowed. The patient's own inclinations should always be studied and, in functional cases, they are particularly important. The idea that such and such a food "alwa[illegible]es" is often an

obsession which has become perpetuated by suggestion—in some cases it amounts to a conditioned reflex. The human mind likes to rationalize the sensations of the body. If a stomach pain occurs, the previous diet is carefully studied and some component is selected as the scapegoat. The next time the offending substance is eaten discomfort is expected and frequently follows. It can then be counted on to produce symptoms whenever it is eaten and thus there occurs the patient who "cannot touch" some perfectly harmless article of food, really as inoffensive to the stomach as human milk. I would not argue that all cases of apparent idiosyncrasy are due to this process; some may be the result of true allergic sensitivity, but I believe that the psychological process I have tried to outline is not by any means uncommon. For many of such patients almost any diet will do, provided it is carefully written out and that it excludes the proved offenders. The three guiding principles should always be Quantity, Quality and Regularity. In addition, in both organic and functional cases, the question of the use of alcohol and tobacco should be carefully considered. Excessive smoking is sometimes, although perhaps not frequently, the sole cause of dyspeptic symptoms and its association with peptic ulcer is well known. Tobacco has less effecter aft a meal than if smoked on an empty stomach and it is a good rule for those who cannot achieve complete abstinence to confine their smoking to immediately after meals. Alcohol is not necessarily always undesirable. The nervous patient with loss of appetite but no organic lesion may be improved by the judicious use of wines, beers, and even spirits; alcohol is one of the most powerful stimulants of gastric secretion and, although uncomplicated achlorhydria may not be associated with any symptoms at all, the resulting secretion will promote peptic digestion and so have a beneficial effect on n[illegible]

No patient should be given a diet without advice on how to eat his meal. As a general rule the purely mechanical dyspepsia reacts best to dry meals with fluid taken generously in between. All classes of patient should be instructed to eat slowly and to masticate their food thoroughly; and for this last purpose an adequate set of teeth, real or false, is essential. These small points sound obvious but it is astonishing how frequently patients are seen, whose medical practitioners have filled them with medicine and powders while neglecting this simple advice, which is more important than either.

LIGHT GASTRIC DIET

For most cases of functional dyspepsia it is best to write out special diets to suit the individual need but a specimen "light gastric diet" is given below as a guide. Such a diet would also be suitable as a "maintenance diet" in cases of healed peptic ulcer or after operations for peptic ulcer.

Light Gastric Diet

On rising.
Glass of orange juice.

Breakfast.
Egg, lightly boiled or poached.
Toast and butter.
Fruit jelly (apple, currant, bramble).

At 11 *a.m.*
Glass of milk or cup of cocoa, ovaltine, bourn-vita.

Lunch.
Fish steamed or grilled; or
Chicken; or omelette.
Mashed potatoes and a purée of some other vegetable—e.g. carrot, turnip, parsnip, pea.
Stewed fruit (without skins or pips).
Junket, jelly, egg custard or cornflour shape

Tea.
China tea.
Rusk or toast with butter and fruit jelly.

Dinner.
Thick, strained vegetable soup.
Steamed or grilled fish.
Chicken, or tender steak or cutlet (grilled).
Vegetables and sweets as for lunch.
Biscuits and cream cheese.
Coffee with plenty of milk.

On retiring.
Milk, cocoa, ovaltine or bourn-vita.

Such a diet, with average helpings, should be quite sufficient to maintain weight, but I would again emphasize the importance of keeping a close watch on the weight. If it is desired to reduce it slightly, the fat and carbohydrate portions of the diet can be cut down.

DIET IN PEPTIC ULCER

Of the organic diseases peptic ulcer requires the strictest dieting as the healing of the ulcer depends largely on the careful observance of the dietetic restrictions. Even more important than the diet is the necessity for rest. I keep my hospital patients in bed until the ulcer is, by radiological evidence, healed; they stay in bed all day except for a bath and the routine visits to the lavatory. In domiciliary treatment this is sometimes a counsel of perfection, but it can quite often be achieved. It is true that ulcers will sometimes heal without confinement to bed—I have known them heal without any treatment at all—but I am sure that the best and, in the long run, quickest results are obtained by insisting on the recumbent posture for the whole period of strict treatment.

There is a wide choice of diets. Most of those in present use are based on the Sippy diet which, in its original form, consisted of 3 ounces of a mixture of cream and milk (equal parts) given every hour from 7 a.m. to 7 p.m. This was gradually built up by the addition of cereals and eggs. Its main defect

is that it is uninteresting and nowadays it is more usual to make use of a diet such as that recommended by Hurst:—

HURST'S ULCER DIET

(1) Every alternate hour from 8 a.m. to 10 p.m. 5 oz. of milk. This may be warm or cold and may be flavoured with tea.

(2) Every other hour, alternating with 1, from 9 a.m. to 9 p.m. a 5-oz. feed which may be made of any of the following—

(*a*) arrowroot, cream of wheat, Benger, junket, custard: to any of these red currant, apple or other fruit jelly can be added and the junket may be flavoured with chocolate;

(*b*) at least two should consist of a thick soup or semi-solid purée of potato, artichoke, cauliflower or parsnip.

A little sugar may be added to the (*a*) feeds and a little salt to the (*b*) feeds if desired.

(3) A rusk with butter should be eaten with three feeds. Small quantities of water or sweetened orange juice and water may be drunk between feeds.

(4) One oz. of cream should be added to the 11 a.m., 1 p.m. and 5 p.m. feeds, and ½ oz. of olive oil should be taken before the 9 a.m., 2 p.m., and 7 p.m. feeds.

(5) One teaspoonful of mixture A (*see* below) should be added to each milk feed, and one or more additional drachms of emulsio magnesiæ, according to the state of the bowels, are taken immediately before.

(6) One teaspoonful of mixture B (*see* below) before the 8 a.m and 3 p.m. feeds, and two teaspoonfuls before the 10 p.m. feed.

(7) One teaspoonful of tribasic magnesium or calcium phosphate with a little water after the 3, 7 and 10 p.m. feeds. An extra powder should be taken after any other feed during the day or night if the slightest indigestion or heartburn occurs.

(8) The mouth should be washed out after each feed and the tongue thoroughly cleaned by scraping with a spatula night and morning.

(9) No smoking should be allowed during the strict treatment.

(10) During the night the patient should have a feed with mixture A by his bedside so that whenever he wakes, whether in pain or not, he can take a feed. This can be repeated at intervals of an hour or more whenever he is awake during the night.

Mixture A.

℞	Sod. citratis - - - - -	15 grains
	Aquam ad - - - - -	60 minims

Mixture B.

℞	Atropinæ sulphatis - - - -	1/200 grains
	Aquam ad - - - - -	60 minims

The dose of mixture B should be increased if no dryness of the mouth or difficulty in visual accommodation occurs.

There is no doubt that this is an excellent diet and there is hardly any ulcer which will not heal if it is rigidly followed and the patient kept in bed. If anything it errs on the side of strictness, and I am in the habit of adding feeds of sieved vegetables and fruit in addition to those allowed in the diet.

Renewed interest in the question of ulcer diets has been stimulated by Meulengracht's seemingly daring treatment of hæmatemesis by a relatively full diet. This author believes thathe gets better results in cases of hæmatemesis by beginning treatment right from the start with what he calls a "purée diet." As described by him the diet is as follows:—

MEULENGRACHT'S DIET

6 a.m.	Tea, white bread and butter.
9 a.m.	Oatmeal with milk, white bread and butter.
1 p.m.	Dinner.
3 p.m.	Cocoa.
6 p.m.	White bread and butter, sliced meats cheese and tea.

Dinner includes a number of dishes—e.g. meat balls, timbale, broiled chops, omelette, fish balls, fish gratin, mashed potatoes, vegetable purées, vegetable soup, cream of vegetables, stewed apricots, apple sauce, gruel and rice and tapioca puddings. The patients are allowed to have as much as they want.

One of the advantages claimed for this diet is that the anæmia resulting from a considerable hæmatemesis clears up quicker that with the more conventional form of milk diet. I think, however, that the Hurst type of diet is probably equally successful provided that full doses of iron are given if there is any anæmia. For practical purposes a judicious combination

of the two will probably be found as successful as anything. The more solid articles of food should be reserved for those patients who are unduly depressed by the soft diet and who have the power to masticate sufficiently. It must never be forgotten that, in all gastric disease, the condition of the food that enters the stomach is more important than that which enters the mouth. When the teeth are adequate a good deal of preliminary preparation can be eliminated.

In ulcer cases the change from the strict diet to the "post-ulcer regime" should not be too abrupt. Hurst recommends the following:—

INTERMEDIATE ULCER DIET (HURST)

(1) 9 a.m. and 5 p.m.
Olive oil ½ oz. and 1 teaspoonful of atropine mixture.
Weak milky tea.
One or two lightly boiled, poached, or scrambled eggs.
Thin bread and butter or toast.
(2) 1 p.m. and 7 p.m.
Olive oil ½ oz. with a teaspoonful of atropine mixture.
Fish or chicken with mashed potatoes and vegetable purées.
Custard and junket.
(3) Every hour from 8 a.m. to 10 p.m. (except 9 a.m. and 1, 5 and 7 p.m.).
Take some of the following mixture:—
1 quart of milk.
5 oz. of cream.
120 grains of sodium citrate in 1 oz. of water.

Every patient who has had an ulcer, whether it has been treated medically or surgically, should observe a permanent regime afterwards. In spite of this recurrences will occur, but they are far more frequent in patients who have failed to observe the instructions given or (as happens too often) who have had no instructions. For many years I have used the following:—

AFTER-TREATMENT OF PEPTIC ULCER

Avoid all the following articles of food and drink

Alcohol in all its forms; effervescing drinks, strong tea or coffee.

Pips, skins and unripe fruit; nuts; especially avoid cakes with currants, sultanas and carraway seeds.
Raw vegetables. If green vegetables are taken, they should be finely chopped, or passed through a sieve and mixed with butter.
Porridge, unless made with the finest oatmeal.
Vinegar and all sauces, condiments which contain it—e.g. pickles, chutney and salad dressing; also mustard, pepper, curry, and sour and acid drinks.
Tough meat, twice cooked meat, and cheese (except cream cheese). New bread and salted fish or meat. Meat soups. All very hot drinks.

Take plenty of butter and fat

Eat slowly and chew thoroughly. See that your meals are punctual.
Keep your teeth in good order and go to your dentist every six months.
Do not smoke excessively. If possible do so only after meals or not at all.
Take some food or milk between breakfast and the midday meal; also on going to bed and, if awakened by anything, in the night.
Take no medicine without a doctor's advice; never take pills or tablets.

GASTRITIS

It only remains to consider the question of gastritis. In the localized gastritis and duodenitis which usually precedes peptic ulceration the dietetic treatment is exactly the same as for the fully developed ulcer, with the qualification that it need not be so prolonged. It is well, however, to insist on the full strict treatment when the symptoms and signs suggest that this condition is present, as the object is to prevent the development of ulcer. A few weeks in bed on a strict diet in the early stages may save many months later on.

In the diffuse gastritis such as accompanies alcoholism, in which there is usually an absence or deficiency of free hydrochloric acid, a fairly wide latitude may be allowed. There is no need to cut out the meats and meat extracts as their stimulating effect on gastric secretion may be helpful. The most important requirement is to eliminate the irritating substance; this is commonly alcohol but may be some other article of food which has been abused, such as vinegar, or continued infection from bad pyorrhœa. The light gastric diet given above would be suitable for most cases.

LIMITATIONS OF GASTRIC DIETS

It must not be imagined that all gastric disturbances can be controlled by dietetic restrictions and medicine alone. I have already referred to the necessity for insisting not only on what the meals should consist of but also on how and when they should be taken. It is also necessary to make a careful inquiry into the patient's habits, especially with reference to exercise, fresh air, hours of sleep and the nature of his work. Suitable adjustments to any of these will not infrequently be sufficient to relieve gastric symptoms without any alteration to an already suitable dietary.

It should also be remembered how frequent is the fear of cancer in the middle-aged of both sexes. This fear is often not expressed in words, but an assurance from the doctor, backed, if necessary, by an X-ray examination, that there is no possibility of any sort of growth will, in many cases, be all that is needed to restore an apparently faulty digestive function. Neglect of these non-dietetic factors is a frequent cause of failure of dietetic treatment in functional gastric disorders.

CHAPTER VII

DIET IN CONSTIPATION AND OTHER INTESTINAL DISORDERS

By R. A. HICKLING, M.D., F.R.C.P.

CONSTIPATION

IMPORTANT among the causes of constipation are an intake of insufficient fluids, and the adoption of a diet insufficiently bulky. The taking of insufficient fluids induces excessive hardness and dryness of the fæces, rendering their passage through the colon and rectum difficult. Insufficient fluids are taken by many individuals partly from habit and because the importance of taking large amounts of fluids is not realized, and partly because of the inconvenience which arises from the excretion of large amounts of urine. Patients should be taught that the inconvenience of having to pass urine frequently is a small price to pay for the benefit which they will derive from taking increased amounts of fluids.

The diet taken by many individuals is largely composed of highly purified and concentrated foods. An effect of this is that the diet is small in bulk, so that the normal reflex stimulus to the colon which is produced when food is taken into the stomach is inadequate. Another effect of such a diet is that it is so completely digested and absorbed that there is little residue to produce the mechanical stimulation of the colon which is necessary in order that it should function correctly.

The correction of these two faults will relieve a great many

cases of habitual "atonic" constipation, without any drug treatment, though in some cases drugs may be required for a short time at the onset of the treatment, until the habit of a thorough daily bowel movement is established.

Fluids are most effective in assisting bowel movements when taken first thing in the morning, when the stomach and small intestine are empty. Cold fluids taken at this time have a powerful effect in stimulating movements of the stomach and small intestine, and causing reflex stimulation of the colon.

The correction of the fault of taking an insufficiently bulky diet may be brought about by giving foods which contain a high proportion of indigestible residue, chiefly in the form of the cellulose of vegetables and fruit. Many individuals take small meals because they do not wish to gain weight, yet a diet may be small in bulk and still be of high caloric value, if it includes considerable amounts of sugar, sweets, chocolates, bread, cakes, and pastries. A bulky diet may be given, which will be helpful in constipation, without being of high caloric value, if these concentrated foods are taken only in small quantities. In addition to the effect produced by the indigestible residue in increasing the bulk of the fæces and so increasing the direct mechanical stimulation of the colon, the inorganic acids in vegetables, and especially in fruit, act as mild stimulants to the intestine and colon. Since it is most convenient for the bowels to be opened after breakfast, it is important that breakfast should be a bulky meal, to ensure that there should be an adequate reflex stimulation of the colon resulting from taking a large amount of fluid and solid food into the stomach.

In the following diet attention is paid to the intake of large amounts of fluids and of foods which are bulky and contain much indigestible residue.

GENERAL INSTRUCTIONS TO PATIENTS

As soon as you awake take a glass of cold water. If desired, a cup of weak tea may be taken ten minutes later. Take a second glass of cold water shortly before breakfast.

BREAKFAST: Always begin by taking an orange, half a grape-fruit, stewed prunes, or stewed figs. Next take a plate of bran flakes, or coarse oatmeal porridge, with milk, cream, and sugar. Take at least two, and preferably three, cups of tea or coffee. Take wholemeal bread (not ordinary brown bread), plain or toasted, with butter, marmalade, or honey. If desired, eggs and bacon, herring, or ham may be taken in addition.

Never neglect the attempt to have the bowels opened after breakfast, allowing enough time for the purpose. Only in this way can the regular daily habit be re-established. Take at least two glasses of water during the morning.

LUNCH AND DINNER: Take at least two of the following vegetables with each of these meals:—celery, spinach, carrots, cabbage, asparagus, onions, leeks, tomatoes, parsnips, turnips, beet-root, peas, beans. Always take at least two glasses of water with each of these meals. Always take some fruit in addition, such as an apple, pear, figs, raisins.

TEA: Take three or four cups of tea, ryvita or vita-weat biscuits, and butter. Tea should be left in contact with the leaves for a few minutes only, and then poured into a second tea-pot. Made in this way, the tea will contain very little tannin, which is constipating.

DIET IN COLONSPASM (SPASTIC CONSTIPATION), AND MUCO-MEMBRANOUS COLITIS

Although these related conditions are of "nervous" origin, alterations in the diet may be of considerable assistance in treatment. Some physicians advise a bulky high-residue diet, as used in the treatment of "atonic" constipation. The majority, however, advise a diet designed to cause the minimum stimulation of the irritable colon, together with the administration of belladonna. All foods that contain much indigestible matter, especially pips, skins, and other hard substances, are omitted from the diet.

The following diet is suitable in these conditions, and in any condition in which it is desired to give a diet which is not irritating to the gastro-intestinal tract, for example, when a patient is recovering from an attack of diarrhœa, and during recovery from ulcerative colitis.

Breakfast: The juice of an orange or grape-fruit, with sugar to taste. Fine oatmeal porridge, or "cream of wheat," with milk, cream, and sugar. Eggs, lightly boiled, poached, or scrambled. White bread, plain or toasted, butter, honey, marmalade jelly. Weak tea or coffee, milk, sugar, and cream. Cocoa or chocolate.

Lunch and Dinner: Choose from the following articles of food:—Vegetable soup, without any hard particles, for example cream of tomato soup, cream of potato soup. Boiled or steamed fish, or pounded fish, with cream sauce. Boiled or roast lamb or chicken. Mashed potato. Cauliflower, without the green parts. Purées of spinach or carrots. Milk puddings, such as custard, junket, rice, tapioca Ice cream. Fresh fruit juice, with cream and sugar. Cream cheese. White bread, plain or toasted.

Tea: Weak tea, with plenty of milk. White bread, plain or toasted, with butter, honey, jelly. Plain biscuits with butter.
Avoid all condiments, except salt.

DIET IN INTESTINAL FLATULENCE

Flatulence is the result of swallowing excessive amounts of air, or from abnormal fermentation in the intestines. The swallowing of excessive amounts of air may occur during swallowing food and drink, or it may occur between meals, due to a faulty habit (ærophagy). The patient is generally unaware of this habit, and an explanation will by itself help considerably in producing relief. It is sometimes surprising to observe how rapidly relief from great discomfort occurs, after the patient's attention has been drawn to the cause of the flatulence. Patients should be advised to eat and drink carefully and without hurry. Fluids should be taken before and after the meal, and not during the meal. The chewing of a charcoal biscuit after meals is helpful in causing adsorption of some of the swallowed air.

It is mainly carbohydrate foods which undergo fermentation in the intestines, producing flatulence. In the early stages of the treatment of "atonic" constipation, by the adoption of a high-residue diet, flatulence may be troublesome, since the diet contains large amounts of cellulose and other carbohydrates. But as the constipation becomes relieved, this flatulence soon disappears, so that no special treatment is needed. But in other cases in which it is considered that the main cause of intestinal flatulence is the abnormal fermentation of carbohydrates, it is desirable to restrict carbohydrates until the symptoms have disappeared. The following diet may be used in such cases:—

BREAKFAST:	Orange, 3 oz. Eggs, boiled poached, scrambled. White bread, toasted, 1 oz. Butter, ¼ oz. Weak coffee. Cream, 1 oz.
LUNCH AND DINNER:	Broth, or soup made from marmite, oxo, bovril. Eggs, fish, or meat. Cheese. Butter. White bread, 1 oz. Purée of spinach, 3 oz., or purée of carrots, 3 oz. Custard or junket.
TEA:	Tea, with milk but no sugar. White bread, toasted, 1 oz. Butter, ¼ oz.

Sugar and other vegetables and fruits should not be taken until the symptoms have disappeared. These may then gradually be added.

DIET IN DIARRHŒA

When diarrhœa is due to ingestion of irritating matter with the food, all that is generally needed is the administration of a purgative to clear the irritating matter from the intestines, and a day or two of starvation, to rest the alimentary tract. During the period of starvation enough water should be allowed to prevent any feeling of thirst, but large amounts

of fluid should not be taken, because of the resulting stimulation of the intestinal movements. Barley water, lemonade with plenty of sugar, and drinks made with marmite or beef extract may also be given. As a rule the diarrhœa soon ceases, and the patient's appetite returns; the patient's usual diet may then be resumed, or he may be given for a few days a simple non-irritating diet, such as that described under the heading of colonspasm and muco-membranous colitis, as an intermediate step to resuming his usual diet.

Diarrhœa from any cause which lasts more than two or three days requires more care, because the patient may become weakened and may lose weight as a result of the starvation itself, quite apart from the condition which is causing the diarrhœa. In these cases plenty of sugar should be given, which prevents a condition of ketosis from developing as a result of the starvation, as well as being a concentrated food which is completely absorbed. Sugar may be given with orange juice, lemonade, barley water, and in milk flavoured with tea, coffee, and cocoa.

When diarrhœa lasts for more than a week, and especially if it appears likely that it may last for much longer, as in cases of ulcerative colitis, and in some cases of typhoid fever, an attempt should be made to give a diet with a high calorie value, in order to prevent much loss of weight during the illness; for, if this occurs, convalescence will be greatly prolonged after the patient has recovered from the disease which has caused the diarrhœa. If it is considered desirable to give fluids only, for example on account of loss of appetite, soreness of the tongue and mouth rendering mastication impossible, or exhaustion of such a degree that the patient is fatigued by mastication, a diet of considerable calorie value can be given by the use of raw eggs, milk, cream, sugar, and orange juice. The following diet has a calorie value of about 1,600.

7 a.m.	Orange juice, 5 oz., water 5 oz., sugar 1 oz.
9 a.m.	Milk, 10 oz., cream (average thickness) ½ oz., tea to flavour.
11 a.m.	Milk, 5 oz., cream ½ oz., sugar ½ oz., cocoa to flavour.
1 p.m.	Milk, 5 oz., 1 raw egg, sugar ½ oz.
3 p.m.	Milk 5 oz., cream ½ oz., sugar ½ oz., coffee to flavour.
5 p.m.	Milk 5 oz., cream ½ oz., marmite to flavour.
7 p.m.	Milk 10 oz., cream 1 oz., 1 raw egg.
9 p.m.	Milk 5 oz., sugar ½ oz., cocoa, ovaltine, glaxovo, Benger's food to flavour.

Water may be taken between feeds if required.

This diet may produce abdominal distension, or cause nausea, and so may have to be reduced in total volume, or the sugar and cream may have to be reduced in amount; but in an illness which may last many weeks it is most important that an attempt should be made to give a diet of adequate calorie value. Fortunately it is rarely necessary to give fluids only for a long time. Alternative feeds in the above diet can be replaced by junket, custard, and other milk puddings; white bread from which the crust has been cut, with butter, honey or jelly, and lightly boiled eggs.

As recovery occurs, the diet described for colonspasm and muco-membranous colitis may be given, as an intermediate step to resuming the normal diet.

CHAPTER VIII

DIET IN DISEASE OF THE LIVER AND BILIARY SYSTEM

By JOHN H. ANDERSON, C.M.G., C.B.E., M.D.

THE primary dietary consideration in disease is to provide adequate nourishment in a form which will reduce the strain on any already overtaxed organs. In this way the pathological process is not aggravated, but the curative processes of the body itself, and of any other methods of treatment employed, are aided and strengthened. In addition individual likes and dislikes have to be considered, a point often neglected, and the practitioner may be forced to effect a compromise between what is best for the patient and what the patient can and will take. When the liver is at fault this second consideration may play a big part. Hepatic disease is often accompanied by nausea, anorexia, and other alimentary disturbances, and, under these conditions, it is often difficult to find a palatable and acceptable diet, and much less a suitable one.

The broad principles of the part played by the liver in the digestion and assimilation of food may be summarized as follows:—

As regards the sugars and starches the liver has to do with the formation and storage of glycogen and with its hydrolysis, when required by the tissues. It is actively concerned with the storage and activation of fat and also plays a leading part in the preparation of fat when required by other parts of the body. The bile salts help in the absorption of fat from the

bowel; if there is a deficient excretion of bile, irritating fatty acids are formed and protein putrefaction occurs. The end products of protein digestion reach the liver as amino-acids. Some pass straight through on their way to repair tissue waste throughout the body; the remainder stay in the liver and are utilized in the formation of urea and of carbohydrate. The liver also has a general detoxicating action on the blood, uric acid being one of the poisons destroyed by it.

Diet in liver disease has been built up along two main lines of research. An empirical one founded on clinical observations by practitioners and suggestions made by patients over many years. It is doubtful if there is any other disease in which more attention should be paid to a patient's dislike or avoidance of some apparently inoffensive article of diet. The statement " It's no good, doctor, I can't take so and so, it's poison to me" is a warning that should never be disregarded lightly. A more recent and more scientific contribution is supplied by the laboratory, often reinforced by animal experiments. In these two ways it has been found that hepatic insufficiency requires a diet containing plenty of carbohydrate, very little protein and with the fat restricted both in the actual food and in its preparation. The amount given depends on the patient's weight and so varies in individual cases. Bland fluids can be given freely as a rule, but coarse and irritating foods and those "hard to digest" should be avoided.

Liver disturbance may be associated with, or be secondary to, disease in other organs and the primary lesion must be remembered in prescribing a diet. The gastric catarrh often seen in cirrhosis of the liver and the engorged liver due to a failing heart, illustrate this point.

DIETS IN LIVER DISORDERS

The dietary principles of plenty carbohydrate, little protein

and restricted fat are much the same in all cases of liver disease. The following grouping of diets forms merely a useful working basis and is not founded on any scientific classification.

A. *"Bilious attack;" "chill on the liver;" hepatitis; liver congestion of gastro-intestinal origin; catarrhal, toxic, or infective jaundice.*

In the acute stages, fluids given two-hourly are the best form of alimentation and the patient should take as much as can be managed comfortably. Fluids to choose from are ordinary or aerated water, barley water, fruit juice (lemon, orange, or grape-fruit) and water, skimmed milk, albumen water, whey, and hot weak tea. Whenever possible fluids should be sweetened with glucose and barley sugar or some of the glucose sweets on the market given to suck. Alcohol in every form should be avoided.

An intermediate stage between fluid and solid food can be arranged as follows:—

BREAKFAST:	Soft cereal (with skimmed milk or syrup); white toast; jelly; weak tea, with skimmed milk or lemon.
MID-MORNING:	Juice of two oranges in water sweetened with glucose.
LUNCH:	Vegetable soup (made with stock or skim milk), chicken broth or tea; fruit jelly or stewed fruit; white toast.
AFTERNOON TEA:	White toast with jelly or seedless jam; weak tea with skimmed milk or lemon.
EVENING:	Bread and (skimmed) milk, well sweetened
BEDTIME:	Orange juice or barley water, with glucose..

When solid food is tolerated the following indications are helpful:—

Avoid rich, greasy and fried foods; do not use butter, lard, strong condiments or spices in cooking, and limit sauces to a simple white sauce. Use lean and tender meat and remove all excess fat before and after cooking (it is often best served cold); take no sardines in oil, salmon, pork, goose, duck, pastries, pies, or rich cakes. Breads, cereals, fruits, and vegetables which are coarse and leave much residue, are not good. Simple foods should be preferred to made-up dishes. Alcohol should not be used as a beverage.

A choice may be made from the following according to the condition and appetite of the patient:—

BREAKFAST: Fruit; cereal (with skimmed milk or syrup); white bread or white bread toast or rusk; jelly or marmalade; weak tea with skimmed milk or lemon. Fish or egg or bacon may be added later in that sequence.

MID-MORNING: Orange juice (juice of two oranges in a third of a pint of water), sweetened with glucose.

LUNCH: Vegetable soup (made with stock or skimmed milk), chicken tea or chicken broth; fish; chicken, rabbit, tender mutton or beef; potato (not roast); green vegetables, sieved or well mashed with a fork; simple boiled pudding or stewed or fresh fruit; toast; water, soda water or fruit-juice extract and water to drink.

TEA: White bread or toast and jelly or seedless jam; light cake or simple biscuit; tea with skimmed milk or lemon.

DINNER: As lunch.

B. *Chronic venous congestion of the liver; cardiac liver; nutmeg liver.*

The causative factor is a back-working due in practically every case to an obstructive heart or lung disease. In cardiac disease protein is well tolerated and a high carbohydrate content in the diet may produce a distressing flatulence. A balance must therefore be struck between the demands of the heart and of the liver. Meals should be small and the largest one taken in the middle of the day. They should be dry and the twenty-four hour fluid intake limited to twenty to thirty ounces; barley sugar or acid drops sucked between meals help to alleviate any feelings of thirst. The only salt allowed is that necessary in cooking and even this should be kept low. Some glucose should be taken daily.

In constructing a diet the general indications set out in "A" (p. 109) should be followed, and both quantity and quality will vary greatly with the condition of the patient.

In a case of moderate severity choice may be made from the following:—

BREAKFAST: Lightly boiled or poached egg; toast with jelly or marmalade; tea with milk or cream, sweetened with sugar.

DINNER. Tender meat, chicken, rabbit, or white fish; potato; sieved or purée vegetables (but no peas, beans, onions, or broccoli); milk pudding or fruit, stewed or as purée; rusk or toast.

TEA: Tea with cream or milk and sugar and not more than one or two biscuits or rusks.

EVENING: White fish, tongue or a slice of cold meat; toast and butter. A useful variant is bread and milk sweetened with glucose or ordinary sugar.

Fluid is best taken with breakfast and tea, and about an hour before the other two meals. Water, barley water, orange juice, and water with a little glucose are suitable beverages. Alcohol should only be used medicinally.

C. *Cirrhosis of the liver; alcoholic cirrhosis; chronic interstitial hepatitis.*

The accompanying gastritis adds to the dietary difficulty in liver cirrhosis. In severe or advanced cases the diet should be as bland as possible and milk is the best food. It may be diluted with water, soda water, or mineral water; flavoured with tea or coffee, citrated or peptonized; Benger's or a milk jelly are useful variants. At least four to five pints should be taken daily in two- to three-hourly feeds. In addition a couple of feeds of orange juice and glucose should be given. In less severe cases the intermediate diet set out in "A" above will form a suitable menu.

If a more generous diet is possible the following indications should be followed:—

Avoid all rich, greasy, fried, spiced, seasoned, and twice-cooked foods, rich sauces, clear strong soups, pastries, pickles, curries, and foods containing vinegar, shreds, pips, skins, hard pieces, or seeds. A choice may be made from the following:—

BREAKFAST: Soft cereal; egg in any form except curried; white fish (not fried); toast and seedless jams or jelly or marmalade jelly; tea with milk, sweetened.

LUNCH: Tender lean mutton, chicken, rabbit, or tripe; potato, mashed (with milk) or baked in jacket; jelly or custard or light steamed pudding; toast.

TEA: Toast and jelly; plain biscuits or rusks; light sponge-cake; tea and milk, sweetened.

DINNER: As lunch, with the substitution of boiled or steamed white fish (with plain white sauce) for meat. Sieved vegetables and well-stewed fruit may be given at either/or both lunch and dinner after cautious trial. Again orange juice and glucose are advised at least once a day, preferably with or after a main meal.

Alcohol is contra-indicated and the only salt allowed is that used in cooking.

D. *Acute necrosis of the liver; acute yellow atrophy.*

Carbohydrates and fluids should be pushed to their full extent. The oral, duodenal tube, and intravenous routes may be used for the administration of both glucose and fluids and in addition fluids may be given by the rectum and under the skin. As improvement is made milk, flavoured, thickened with a cereal or peptonized should be added cautiously.

DIETS IN GALL-BLADDER DISEASE

A. *Acute cholecystitis.*

Bland fluids should only be given in the febrile stages and water is the most suitable. It may be varied with barley water, very weak tea with lemon, and alternate feeds should be sweetened with glucose.

B. *Chronic cholecystitis with or without gall-stones.*

Long intervals between meals and too restricted fats tend to a stagnation of bile. Frequent small meals therefore should be preferred to fewer and larger ones. Notwithstanding its beneficial effect on the drainage of the gall-bladder a large amount of fat is not advisable. Very often the patient is already obese and will benefit from a reduction of weight, so fattening foods should be omitted. Many gall-stones are rich in cholesterol and it would seem wise therefore to prohibit foods with a high cholesterol content. On the other hand the cholesterol in the bile does not come from the food, and it is generally accepted that the influence of the food on the blood

cholesterol may be neglected. Practical experience, however, shows that foods rich in fat or cholesterol are better omitted or reduced. The liver disturbance associated with gall-bladder disease is helped by carbohydrates.

GENERAL INDICATIONS.

Avoid: fried, fatty and rich or made-up dishes, eggs (except once a day), brains, sweetbreads, liver, goose, duck, kidneys, pork, oily fish (salmon, sardines), foods cooked in butter or lard, pastries, peas, beans, raw vegetables, strong cheeses, and alcohol as a beverage.

Allow: skimmed milk and soups made with it, cooked vegetables (except peas, beans, and onions), cereals, white meats, lean red meats (boiled, grilled, or roasted), salt-water fish, mild cheese, and cooked fruit. Butter and cream may be taken in moderate amounts. Bland fluid is good and should be taken freely, preferably away from meals.

The following menu is suggested from which a choice may be made, the quantities depending on the patient's weight.

BREAKFAST: Soft fruit or fruit juice; light cereal with skimmed milk or syrup; egg in some simple form or fish; toast, a little butter and marmalade. Tea or coffee with skimmed milk.

MID-MORNING: Orange juice with water, sweetened, and a couple of rusks.

LUNCH: White meat or lean meat; a little potato; green vegetables; carrot or turnip (sieved or as purée if not young and soft); stewed fruit or small milk-pudding or mild cheese and biscuit.

TEA: White bread or toast; a little butter; seedless jam, honey, or jelly; sponge-cake; tea with skimmed milk.

DINNER: Much as lunch with soup (made with skimmed milk and flavoured with vegetables) or fish added.

If the egg is not taken at breakfast it may be used in a light sweet at lunch or dinner.

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CHAPTER IX

DIET IN ENDOCRINE DISORDERS AND OBESITY

By D. M. LYON, M.D., D.Sc., F.R.C.P.E.

SINCE the endocrine glands are so intimately associated with the control of metabolic processes, it might be expected that dietary measures would be an important factor in the treatment of disorders of this system. Yet this is not the case except in a few instances. In this group of diseases dietary control occupies merely a secondary position in treatment. The outstanding exception is diabetes mellitus, in which the subject is so important as to require separate attention.

DIETING IN HYPERTHYROIDISM

The thyroid gland occupies an interesting and important position in the endocrine system. It is often referred to as the master gland because of its influence on other parts of the body and on metabolism generally. The activity of all body cells depends on the condition of the thyroid and on the amount of thyroxine thrown into the circulation. In myxœdema, in which the thyroidal stimulus is deficient, the general level of cellular metabolism is decreased and all activities become sluggish. Hyperthyroidism shows the opposite picture. Under the stimulus of excessive thyroxine every cell in the body becomes more active and the total metabolism is increased. An idea of the activity of metabolic processes can be obtained by estimation of the basal metabolic rate (B.M.R.) which takes account

of the height, weight, age, and sex of the subject and can be used for comparing one individual with another. The B.M.R. does not give direct information regarding the total caloric requirement of a patient for a day. It only indicates at what rate the body is using up energy when at complete rest. The information is of about the same value as the knowledge that a certain car will use so much petrol if the engine is quietly ticking over in the garage. It is usual to assume in human calorimetry that a person will require for a quiet day's work some 50 per cent. more calories than for the basal processes of life. Individual needs must vary greatly according to physical activity. The hyperthyroid subject with a high B.M.R. is living at a more extravagant rate than is a healthy individual. His every breath, every movement, costs him more than the standard price. He is like a rich aristocrat whom all the tradesmen fleece. A patient with a B.M.R. of +70 is paying nearly double price for bare existence and it is probable that every extra effort must be paid for at the same extravagant rate. This excessive expenditure must be met by increased income or by utilization of capital. No doubt, in hyperthyroidism the appetite is often increased and more food is consumed, but despite this there is usually loss of weight, often considerable in degree. The loss may have amounted to two or three stones before the patient appeals for help and it will continue so long as the metabolic rate is high, if steps are not taken to compensate for it. Treatment directed to reducing metabolic activity will tend to arrest the loss, but usually there is a considerable leeway to be made up. In any case it is well to try to prevent the patient losing further weight and becoming weaker, and it is usually desirable to try to improve the patient's general physical condition before operative treatment is recommended. Continued loss of weight means simply that food is being used up at a greater rate than it is

being consumed and it is obvious that if the loss is to be arrested a higher intake of food will be necessary. There is therefore a sound argument for the use of high caloric diets in hyperthyroid cases. If a healthy person requires 1,600 calories for the continuation of basal processes, 2,400 calories (50 per cent. excess) should meet the needs of a quiet life for 24 hours. A hyperthyroid subject of the same size and age with a B.M.R. of +60 would probably require nearly 4,000 calories daily. A food intake which merely matched the utilization of calories would put a stop to the loss of weight but would allow no margin for storage. It is therefore obvious that in severe hyperthyroidism the patient should be encouraged to take as large a diet as possible. In order to help matters it will be well to present the food in as concentrated a form as possible and bulky calorie-poor foods should be reduced to a minimum. The patient should be given four good meals a day and should be encouraged to take extra snacks between meals. Fats are the most concentrated form of food energy, for they will yield nine calories per gramme as against four calories for each gramme of carbohydrate or protein. They should therefore be given as liberally as possible. The intake of butter should be increased considerably and cream may be given in various ways—in coffee, tea and on puddings. A useful plan is to give extra drinks of equal parts of cream and milk (each tumblerful —10 oz.—of this mixture gives 405 calories). In pushing the fats, however, it is well to make sure that the appetite is not reduced, for fats are known to lessen gastric activity.

The carbohydrate content of an ordinary diet lies between 400 and 500 grammes (1,600–2,000 calories). Sugars and starchy cereals offer the most concentrated forms of carbohydrate. A thin slice of bread (1 ounce) gives 79 calories, and will easily carry two small balls of butter (say 1/3rd of an ounce = 76 calories). Biscuits, cakes and starchy puddings

well sweetened will give variety and will help to increase the caloric value of the diet. Another useful plan is to give glucose fruit drinks between meals—a tumblerful containing the juice of an orange and an ounce of glucose will give 170 calories. The question of the proper amount of protein to be supplied is not so easily settled. The raised metabolism implies an increased loss of nitrogen from the body which should be made good from the food. On the other hand, protein foods stimulate metabolism and might be cut down on theoretical grounds. Probably the best plan is to allow an intake of 80–100 grammes which is the average amount in an ordinary diet.

Hyperthyroid cases put on this high caloric regime often gain weight satisfactorily, and have an increased feeling of well-being and strength. Two complications of the hyperthyroid state make the handling of these patients difficult in certain cases. Over-action of the bowels is commonly found and may become troublesome. When this is present, roughage should be reduced to a minimum and the fat content of the diet should be temporarily reduced. The other complication is the occurrence of glycosuria. This may sometimes be a transient symptom of nervous origin; at other times loss of sugar is considerable and symptoms may occur which suggest the presence of a diabetic condition. In any case the glycosuria means a waste of much needed calories and it must further aggravate the weakness and loss of weight. When this symptom is more than an occasional feature it is probably best not to attempt to get rid of it by reducing the carbohydrate but to continue to give the full high caloric diet and at the same time give increasing amounts of insulin to try to control the glycosuria. Even if the loss of sugar is not completely arrested the high diet and insulin will allow more food to be stored.

The administration of iodine in cases of hyperthyroidism should be regarded as drug therapy rather than as dieting.

The supply of iodine has an important bearing on the occurrence of other forms of goitre. The thyroid enlargements which develop in goitrous districts are believed to be due to a deficiency of iodine in the food and water supply and they can be prevented by simple precautions. The use of specially medicated table salt, or short courses of iodine once or twice a year, will protect most people against endemic goitre. Care to supply adequate quantities of iodine-rich foods will also be satisfactory. The richest sources of iodine are fish and sea foods, also green vegetables, such as lettuce, spinach and broccoli, except when these are grown in iodine-poor soil.

Myxœdema and the subthyroid states do not call for the use of any special dietetic measures except when the patient shows definite signs of obesity.

DIETING FOR OBESITY

The secret of obesity is not yet fully understood. It is a complex problem and there are many possible causes. Some patients have definite signs of endocrine disturbance; most appear healthy in every respect except their weight. Many are physically active and some are really hard workers. Only a small proportion of the cases are gross overeaters, and the vast majority claim that they have relatively small appetites, or at least that they do not eat more than their neighbours. This may be true so far as the bulk of the food is concerned, but the caloric value of their intake may be high if the food is in concentrated form and if much fat is used in its preparation. It is commonly found that the diet which the patient has been in the habit of taking is unsatisfactory in several respects. First-class protein is often poorly represented, the protein being principally derived from vegetable sources. There is evidence to suggest that the source of the protein is of some considerable importance, for those of vegetable origin have

less stimulating effect on metabolism than have animal proteins. Concentrated starches and sugars are usually in excess, and the frying of foods introduces extra calories in the shape of fat. Most people forget that such extras as sweets and alcoholic or syrupy drinks have a definite food value, and information about the consumption of these is not usually obtained unless it is specially asked for. Such hidden calories may go far to explain the excessive weight in some cases. A detailed inquiry as to the patient's dietary habits is an essential preliminary to treatment.

It is interesting to note that those who have studied the metabolism in obesity have found no outstanding abnormality and no satisfactory explanation for the disorder. The obese claim to be small eaters and yet they are able to build up excessive stores of food, although they remain as active as other people. If these observations were correct their metabolism must be run on very economical lines and some evidence of this ought to be forthcoming. Yet practically all observers have found that the B.M.R. in such cases is normal. When it is considered that the value of the B.M.R. is related to the patient's actual weight and that this represents a great proportion of inert fat, it must be apparent that their active tissues, muscles and glands must be metabolizing at a greater rate than those of normal persons. This deduction, if true, would throw doubts on the wisdom of using thyroid products to raise the metabolism still further.

Obesity is not a simple problem. Like so many other so-called diseases it is to be regarded rather as a symptom-complex which can be produced by several different mechanisms. Some cases are undoubtedly associated with pituitary or gonadal disturbances; others are merely sluggish people who overeat, but there are many cases in which no adequate explanation can be found. All cases, whatever their origin,

have this in common, that the excessive storage of fat is only possible if the intake of food is greater than the amount metabolized. Capital can only be accumulated if income exceeds expenditure! The weight of normal individuals remains practically constant over long periods of time in spite of considerable differences in food intake. They have the power of burning up any excess without storing it (luxus consumption). The obese individual seems to have lost this faculty. Once it is recognized that accumulation of fat is only possible because more food is being taken than is being used, obvious remedies suggest themselves. It is well to explain the position to the patient so that his full co-operation can be obtained. Reduction of capital must occur if expenses are increased and at the same time income is cut down. Expenditure of energy will be increased by more active physical exercise or by raising the metabolic rate with thyroid. A low calorie diet will arrest the accumulation of fat and, if low enough, will also gradually lead to the removal of the stored reserves. All three measures may be tried at the same time, but there is much to be said for demonstrating the effects of thyroid and of a low diet separately. Naturally patients wish to get well in the easiest fashion and the taking of small pills seems less troublesome than a long period of dietary restriction. The use of thyroid extract without dieting is often quite unsuccessful in this class of case, for the thyroid merely serves to increase the appetite and so counteracts the effects of the raised metabolism. The best plan is to show the patient first of all how his weight can be controlled by dieting, and later to use thyroid if necessary.

Modern dietaries for use in obesity are drawn up on scientific lines. They are of low calorie value, the actual figures ranging from 600–1,500. In designing a suitable diet several factors have to be considered. The actual size of the

diet is of first importance. When the excessive weight is only slight and the individual has noticed the first signs of the youthful figure giving place to middle-age spread, restriction need only be slight. It will probably be enough to cut out sweets, jams and sugar, and to limit bread, biscuits and cakes. For more advanced cases the only successful method is to give the patient written dietary instructions and insist on the quantities being accurately observed. The human body possesses a considerable power of adaptation to various conditions including the food intake. A carefully planned wartime experiment showed that when the food intake of a group of healthy young adults was reduced to 80 per cent. of the former diet, their weight fell for a time and then became stabilized indefinitely at a new level. Something similar is often seen in the case of obese patients on sub-caloric diets, and to be effective the reduction in caloric value must be considerable.

After a good deal of experience it has been found that a suitable value for most patients is 1,000 calories, which is rather less than 50 per cent. of the normal food needs of the subject. Diets of 1,500 calories usually give little result and even a value of 1,200 calories is unsatisfactory except in the case of very active workers. On the other hand, diets which yield only 600–800 calories are too poor. It is difficult to get sufficient bulk or variety at these low levels, and the patient is apt to complain of weakness. A diet to yield 1,000 calories can be obtained with different proportions of food stuffs, but certain factors must be considered in the choice of the most suitable combination. Since the patient is expected to use up his own stores, the amount of fat in the diet can be kept at a minimum. It is well to include a small quantity of butter so as to make the bread more appetizing and at the same time to introduce vitamins A and D, though these may be specially

supplied if desired. A suitable amount is 40 grammes—a little over one ounce. Protein food should be sufficient to maintain nitrogen balance and a considerable proportion of it should be of animal origin. Between 60 and 70 grammes are usually needed for an adult and, as an adolescent requires more protein in proportion to his weight, the same value is also suitable for young people.

The actual quantity of carbohydrate to be given is more difficult to decide. While the average diet of a normal person contains some 400 grammes of carbohydrate, diabetics on the high-fat system can maintain their health indefinitely on 80–120 grammes, and a ketogenic diet only includes 20–40 grammes. In dealing with obese cases it has been found that it is unprofitable to reduce the intake below 80 grammes. At a lower level the diet is unsatisfactory, the patients complain of feeling weak or sleepy, they are often constipated for lack of roughage and the diet has a poor satiety value. With 100 grammes of carbohydrate these objections can be avoided. The composition of a satisfactory reduction diet would be C.100, P.60, F.40, giving 1,000 calories.

A suitable diet would contain lean meat, rabbit or poultry, 2 oz. (an average helping); white fish (not fried), 3 oz.; one egg; wholemeal bread, 3 oz., or 6 vita-weat or ryvita biscuits; 2 apples or 2 oranges; and green vegetables or tomato about ¼ lb. at each meal. The allowance of butter for the day is ¾ oz. Half a pint of skimmed milk should also be taken, and if whole milk is used the calorie value of the diet will be raised by 100 calories. Tea, coffee, and clear soups can be taken as desired. There is no need to restrict fluids, but sweets and sauces and alcohol must be avoided.

The success or failure of dietetic treatment in obesity depends on the attitude of the patient. He (or more often she) must desire to lose weight and must have the will power to

carry out instructions. Without these essentials nothing can be accomplished. At first it is necessary that all foods be weighed or measured; later the intelligent patient may be trusted to guess the values. If full co-operation is obtained, obese cases of any type will show reduction in weight as the treatment continues. All show an initial loss of a few pounds during the first week of dieting and usually a steady loss of 2 lb. per week can be expected thereafter. More lasting effects are obtained in some cases than in others. Sometimes the whole of the excess weight—even as much as five stones—can be got rid of in this way and the patient is then able to keep the weight down at normal by merely avoiding sugars. In other cases the results are not so good, the loss of weight continues for a time and then gradually ceases. When this occurs, and it cannot be explained by the patient becoming more generous in his helpings, it is well to begin to give thyroid, maintaining the diet as before. Once the figure has been restored to normal proportions some patients can keep it so without special attention; others require to continue strict dietetic measures, and more severe cases may have to take thyroid indefinitely as well.

OTHER DISORDERS

Addison's disease is fortunately a rare condition. It offers some interesting problems. The patients often become very thin and they complain greatly of weakness. Yet the appetite is very poor and it is difficult to maintain an adequate state of nutrition. Indigestion or gastritis is often present and the gastric secretions are poor. Constipation is usual, but there are frequent attacks of diarrhœa. The distaste for food may amount to absolute anorexia, and feeding at all times is difficult. In treating such a case the patient's likes and dislikes must be studied and the foods should be carefully selected

and daintily prepared so as to be as tempting as possible. It is well to give small quantities at frequent intervals, for large meals are badly borne and may induce vomiting. Fluids are often more acceptable than solids but at all times it is difficult to get the patient to take sufficient nourishment. When a crisis occurs, with nausea, vomiting and diarrhœa, the question of feeding becomes still more serious. A recent advance in treatment has been the recognition that the suprarenals control the metabolism of sodium chloride, and the condition of the patient can often be vastly improved by giving him large quantities of common salt. A daily intake of 2–4 teaspoonfuls may increase his well being and get rid of the more serious symptoms. During a crisis physiological saline with 10 per cent. glucose should be given by rectum or other channel.

Parathyroid insufficiency is associated with a reduction in the serum calcium and theoretically a liberal intake of calcium-rich foods would be indicated, but the calcium is better given as an inorganic salt, either alone or along with parathormone.

CHAPTER X

DIET IN DIABETES MELLITUS*

By T. IZOD BENNETT, M.D., F.R.C.P.

THE material advance in the treatment of diabetes mellitus which has followed the introduction of the new slow insulins tends, as must almost every pharmacological advance, to obscure other essential aspects of treatment. The introduction of the mercurial diuretics has made it possible to abolish dropsy in many cases of cardiac insufficiency which had previously been resistant, but the wise physician recognizes that the abolition of dropsy in such cases, although it enables the patient to get about far more readily, does not itself materially improve the condition of the heart muscle; the long recognized importance of rest, the avoidance of overeating and other strain, remain principles in the treatment of such cardiac disabilities which are essentially more important than the use of the newly discovered diuretics. Similarly, in the treatment of diabetes little good will ultimately come to any large group of patients if the practitioner relies upon insulin in some form to the neglect of dietetic precautions.

Twenty years ago and even thirty years ago, when knowledge of diabetes was different from what it is to-day, experienced physicians had none the less succeeded in working out certain dietetic principles of high value. It was recognized, and it remains true to-day, that obesity is one of the most important factors in the pathogeny of the disease. At one time it was customary in certain schools to recognize two types of diabetes,

* See also pages 50–55.

"thin diabetes" and "fat diabetes;" it was recognized that the most serious cases were to be found in the former group but that treatment was perhaps more important, because more effective, in the latter group. Admitting that occasional exceptions are found it is quite true to-day to say that the vast majority of the most serious cases are to be found in young persons who will tend, unless treated, to become emaciated, but that the commonest of all groups is to be found amongst middle-aged and elderly persons who are obese and who tend to exhibit vascular phenomena as complications without grave risk of coma; the treatment of the obesity in this latter group can often be accomplished with symptomatic disappearance of the diabetes and with the restoration to complete health by dietetic measures alone without the use of insulin.

If the British race possesses any laudable attributes, and I am persuaded that it does, amongst them must be remembered a tendency to abstemiousness as regards food. This national trait makes the dietetic treatment of diabetes a much easier matter in England and Scotland than appears to be the case on the continents of Europe, Asia, or America. The greatest difficulty in the treatment of the disease in many countries is precisely the reverence for food or drink possessed by the patients; it is for this reason that Jewish patients with diabetes are often more difficult to manage than English ones, and it is for the same reason that patent diabetic foods find a readier market amongst the inhabitants of Central Europe than they do in Great Britain. The habit of continence in eating and drinking is one which must always be encouraged in the diabetic patient; if, when he first comes under observation, he lacks this habit he must be persuaded to acquire it; greediness will bring him difficulties and possibly disaster.

Now although the diabetic should learn to eat sparingly he

should, as regards fluids, be encouraged to take an ample sufficiency. This of course applies to water rather than to alcohol or to such fluids as milk which have a considerable calorie or carbohydrate content ; but water should be taken to the extent of at least several pints a day, and it should never be forgotten that an ample water supply is one of the surest preventives of diabetic coma. When a patient is seen for the first time and is found to be wasted and thirsty and suffering from polyuria, and when the urine of such a patient is not only loaded with sugar but gives a positive test with ferric chloride, it must be realized that coma is threatened ; not infrequently it happens that there will be some inevitable delay before such a patient can come under close obseıvation in hospital or nursing home, and the practitioner is eager to forestall the risk of coma. In such circumstances the water supply is paramount, and it may almost be said that provided such a patient succeeds in drinking full amounts every hour no harm will ensue in the interval before he enters an institution.

Amongst the fluids available to the diabetic are the alcoholic drinks, but certain reservations are important concerning them. The wines and liqueurs containing large amounts of sugar, of which port and the syrupy liqueurs may be taken as examples, are clearly barred. The majority of spirituous liquors are, on the other hand, not in themselves contra-indicated and, in general, the middle-aged or elderly patient with diabetes may perfectly well be permitted his whiskey, brandy, or gin in reasonable amounts. The drier wines, whether red or white, can usually be tolerated perfectly well in the amounts taken with meals by ordinary individuals, and there is no special reason for choosing between the heavier burgundies and the lighter hocks provided that the sweeter white wines are avoided. In patients undergoing semi-starvation with gradual increase in diet a little alcohol is often a

most valuable addition and will sustain them at a time when the low calorie diet tends to be onerous.

It must always be borne in mind that the milder and more elderly diabetic is frequently the victim of some degree of arterial degeneration and in these patients, who are perhaps the most susceptible to treatment by diet alone, the practitioner must always lay down a ration of alcohol consistent with what he would prescribe for the ordinary case of mild arteriosclerosis.

BASIC DIETS AND FINAL DIETS

There was some years ago a tendency to try to place all patients with diabetes on a diet arrived at by calculation after consideration of the age, height, and weight of the individual. To-day it is mostly recognized that such an attempt to mechanize dietetics is devoid of any sound physiological basis. Taking the case of the average adult patient, in whom no provison for further growth has to be made, it would seem wiser to summarize the dietetic requirements as follows :—

When obesity is present slow loss of weight is desirable until this has been corrected ; the adequate diet will then be that which fulfils the following requirements :—(*a*) The patient's weight must remain stationary ; (*b*) the patient's appetite must be satisfied ; and (*c*) the diet must be in accordance with the economic condition of the patient.

Of these three requirements the first may be said to be universally recognized and it is unnecessary to comment further upon it beyond saying that the majority of adult diabetic patients are able, in this country, to live happily on a diet of approximately 1,500 calories. The diabetic is never fit for strenuous work but is almost invariably capable of following the average life of the town dweller with unimpaired efficiency if he is well treated, and such treatment includes a somewhat

sparing diet of lower calorie value than that of most of those around him.

The second requirement is important because it is not reasonable to expect any patient to remain indefinitely upon a diet which he dislikes. Diabetes is a life-long affair, diabetes is best controlled on a sparing diet but, whilst it is desirable to encourage abstemiousness, the practitioner and the dietitian must not make demands which are beyond the power of human frailty. And the third requirement, the economic position of the patient, is of equal importance ; all too frequently the hospital patient is a member of a large family which lives chiefly upon bread, potatoes and other foods of high carbohydrate content ; it is necessary that such a patient should be instructed in the use of other vegetables, but it is to be feared that he is often discouraged at the outset by being advised to add to his diet large quantities of tomatoes, grape-fruit, pineapple, seakale, asparagus, and other things which are altogether outside his possible budget.

At the Diabetes Clinic at the Middlesex Hospital every patient is provided with a small book in which is written his diet in detail and in which is kept a record of his urine tests ; on the first pages of this book are a few simple data amongst which may be cited the statement that there are about 7 grammes of carbohydrate in :—

½ oz. bread, or ¼ oz. toast.
1 ryvita or vita-weat biscuit.
3 oz. quaker oats (cooked).
1 small banana.
½ tumbler of milk.
1 small apple.
1 small orange.
1 lb. of celery, cabbage, spinach, cauliflower, lettuce, tomatoes, or rhubarb (stewed without sugar).

Examination of this table reveals the obvious utility of the low carbohydrate vegetables in the treatment of diabetes.

A recent paper by D. Embleton (1938) emphasizes the importance of the purely dietetic treatment of diatetes ; it is worthy of note that this interesting communication was seized on by the daily Press in order to attack the use of insulin ; truncated extracts were used to bring the general suggestion that insulin is being unnecessarily used in thousands of cases. Deplorable and mischievous though such a suggestion may be, it is probably true that there is insufficient attention given to the dietetics of diabetes although there is little to suggest that ignorance is more generally prevalent to-day than used to be the case.

Before the introduction of insulin the pioneer work of G. Graham in London and of F. M. Allen in America had led to the dietetic treatment of diabetes by preliminary starvation followed by slow and steady increase in the food and particularly of the carbohydrate portion. The dramatic improvements in patients so treated provided a new era in the history of diabetes, and the method is just as applicable to-day as when it was first brought out. Nor is there any difficulty in its application. Reverting to the elementary list of foods containing approximately 7 grammes of carbohydrate which was given above, it will be seen that an initial diet containing abundant water (and it should be noted that clear soup, beef extract, and China tea with lemon may well be included as water) together with one or two sticks of celery, half an apple, and a little lettuce, will constitute starvation without the patient being aware of it. To this diet can be added each day small increases such as cooked vegetables from the list, more fruit, and before long one or more biscuits, together with eggs and a little fish in such a way that within a week the patient is scarcely aware of any deficiency in his diet. Exactly the same method will reveal those patients for whom insulin is essential, and it may well be claimed that the patient's final diet,

with or without his final dosage of insulin, is more rapidly reached by this method than by more "modern" dietetic procedures which aim at placing him immediately on the supposed calorie, carbohydrate, protein and fat requirements of his physiological weight. There is much to be said in favour of the argument that the initial starvation of all diabetic patients, when they first come under treatment, provides a period of rest which is extremely beneficial, and the plan indicated above brings this about.

To summarize this article, and I am aware of the difficulty of compressing so important a subject into a few written pages, it is highly desirable that unless the threat of coma makes the immediate use of fairly large doses of insulin imperative, cases of diabetes, and especially of middle-aged and elderly patients with a tendency to obesity, should be treated with initial starvation followed by the gradual building up of the diet to a level which remains a somewhat restricted one. It is further desirable that practitioners and their diabetic patients should never forget the supreme value of low carbohydrate fruits and vegetables, which constitute the best of all foods for most patients with diabetes. And finally it must not be forgotten that the number of patients with diabetes who can be treated by dietetic measures alone is considerable.

To write this must not for a moment be taken as showing a spirit of criticism towards insulin whether in its original or in its more recent forms. To the serious case of diabetes insulin means restoration to life and health, and even the moderate case of diabetes is often benefited by the daily use of a small dose of one of the slow insulins ; but whether a case may be mild, severe or moderate, dietetic treatment has always been, and remains, of supreme importance.

Reference

Embleton, D. (1938) : *Proc. roy. Soc. Med.*, **31**, 1183.

CHAPTER XI

DIET IN DISORDERS OF THE CARDIOVASCULAR SYSTEM, INCLUDING BLOOD DISORDERS

By HUGH GAINSBOROUGH, M.D., F.R.C.P.

MAN is a fortunate animal inasmuch as he possesses such a large degree of rapid adaptation to changing conditions. He can maintain good health for a long time on diets which vary considerably in quantity and quality, provided always that certain limits are not exceeded on the one hand, and that all the elements essential for nutrition are consumed. Apart from the restrictions produced by poverty or gross ignorance, man's taste, freely exercised, leads him to consume food-stuffs in such variety that, for example, avitaminosis or iron deficiency are unlikely to occur. Food intakes outside certain limits will, however, produce eventually the ill effects of either under- or over-nutrition.

During the Great War, in central Europe, many unfortunate peoples suffered from hunger, and the consumption of diets low in total calorie value led to under-nutrition in which cardiac disturbance, shown by weakened and often dilated hearts, was common. It follows clearly that in cardiac disease, despite the difficulties of feeding patients who might present continued dyspnœa and the poorest of appetites, an adequate amount of easily available nourishment must be administered. On the other hand over-eating may lead to obesity, though all

cases of obesity are not so caused. Obesity, of any origin, may injure cardiac capacity in many ways ; deposition of fat between the muscle fibres impairs the action of a heart which has also to supply an unnecessarily large amount of body tissue, and the activity of the heart is further impeded by the fat deposits of the abdominal wall and the mesentery which hinder free respiration and so often account for a dyspnœa which disappears when patients reduce their weight to a more efficient level. In cardiac disease associated with obesity it therefore follows that though easily assimilated nourishment must be administered for its beneficial action on cardiac activity, so soon as acute conditions have subsided as a result of rest or other treatment, the patient's weight must then be slowly reduced by giving diets of low calorie value.

The most easily and rapidly absorbed food-stuffs are the simple sugars, and it has been well demonstrated that glucose will restore the circulation in experimentally produced myocardial damage in animals. It should be remembered that cane sugar is as rapidly utilized as glucose and that it is much cheaper, though it has the disadvantage of greater sweetness. Glucose in the form of boiled sweets or barley sugar is only slowly eaten ; glucose preparations with added vitamins have little to recommend them. Lactose is less sweet than glucose and can be readily used added to milk or other foods.

ACUTE CARDIAC DISEASE

Under this heading are included pericarditis, myocarditis, and endocarditis occurring in the course of acute rheumatism, toxic myocarditis in the course of other acute fevers, subacute bacterial endocarditis, and coronary thrombosis in the early stages of its course. Here, the necessity of absolute rest and the presence of dyspnœa are indications for the administration of a diet composed largely of fluid or semi-solid food-stuffs, given

in small quantities at frequent intervals. During the period of absolute rest the total caloric value of the diet need not be high as the food requirements are not much above basal metabolic values and because such a diet is not likely to be needed for very long periods. A sufficient approximation for the requirements of an average adult is 2,000 calories, and for a child the diet might be reduced by about 25 per cent. The main portion of the diet should consist of two pints of milk, two eggs, fruit juice, six ounces of sugar, and two ounces of cream. This will produce about 1,900 calories and a suitable menu is as follows :—

8 a.m.	6 oz. milk, 1 egg.
10 a.m.	Orange or lemon juice, 1 biscuit or rusk.
Noon	6 oz. milk.
2 p.m.	Orange or lemon juice.
4 p.m.	6 oz. milk or an ice cream and a biscuit.
6 p.m.	Orange or lemon juice.
8 p.m.	6 oz. milk, 1 egg.
10 p.m.	6 oz. milk.

NIGHT FEEDS : One milk feed, and fruit juice should be available at the bedside if the patient wakes.

The milk feeds can be flavoured with cocoa, chocolate, ovaltine or bourn-vita.

To each milk feed should be added two teaspoonfuls of lactose and a tablespoonful of cream.

To each fruit juice feed should be added a tablespoonful of sugar or more if tolerated.

As the patients' strength increases, the total milk can be decreased and semi-solid foods should be added such as the following : custard, milk puddings, junket flavoured with fruit juice or coffee or chocolate, cereals as porridge, cornflakes or farex, thin bread and butter, clear jams, chocolate mousse, and egg dishes.

Later, four meals per day are given and the sweetened fruit-juice feeds between the meals are retained. The meals will then consist of such ordinary articles of diet as require little effort in mastication.

The diet during convalescence could be constituted in the following manner :—

BREAKFAST

8 a.m.	Oatmeal porridge or cornflakes with cream and sugar ; thin bread and butter ; cocoa.
10.30 a.m.	Sweetened fruit-juice.

LUNCH
1 p.m. Purée of potato, artichoke or cauliflower made with milk and cream ; thin slip of boiled or steamed fish or omelette ; plain fruit jelly.
2.30 p.m. Sweetened fruit-juice.
4.30 p.m. Milk flavoured with tea ; buttered biscuit.
SUPPER
7 p.m. An egg dish or thin bread and butter and cream cheese ; stewed fruit such as apples or pears with cream caramel or custard.
9 p.m. Milk with ovaltine or bourn-vita.
NIGHT-FEED : Sweetened fruit-juice.

HEART FAILURE WITH ŒDEMA

When extensive œdema is present the patients can be treated with the graded diets described in the last section. If, however, the œdema is persistent, despite rest in bed and appropriate medical treatment, one can either reduce the total fluid intake for a short period to a total of forty to fifty ounces per day or the Karell diet can be accepted. The latter consists of the administration of four glasses of milk only per day without additional fluid unless the patient is intolerably thirsty. It is not continued for more than four days after which period the fluid intake is increased to thirty-five or forty ounces and such foods as cereals, soft-boiled eggs, toast or bread with fresh butter are added but without salt.

CHRONIC HEART DISEASE

A large number of conditions, such as chronic valvular disease, myocarditis, coronary artery disease, angina of effort, are sufficiently defined by this heading. Patients who are ambulant and have a degree of cardiac reserve do not require a special dietetic regime. When, however, the patient needs rest in bed, on account of dyspnœa or for treatment, say of irregularities of cardiac rhythm, the diet should be selected in accordance with the principles already described ; meals

should be small and frequent to avoid embarrassment from abdominal distention, four to six ounces of simple sugars should be given daily in fruit juice or other feeds and the diet should be low in salt content.

When obesity is present, diet assumes a greater importance in the treatment. If the cardiac condition is uncompensated and dyspnœa persists or occurs in attacks, then the patient must at first be treated in bed with a diet of 1,500 to 2,000 calories until the dyspnœa becomes much less urgent or disappears. Weight reduction can then be begun and should be continued slowly and cautiously using a diet of about 1,200 calories. The actual amount of food is best determined by the rate of weight reduction, which should be about two pounds per week. The patient should remain in bed at first, but later allowed to get up for a limited period, simple walking exercise being gradually increased in amount as the patient's condition improves.It is important to avoid constipation and to that end sufficient fruit and vegetables should be prescribed in the diet and if necessary bran, agar, or suitable aperients should be used. Weight reduction is very often more easily carried out in cardiac cases than in simple obesity because the patient co-operates more readily as he realizes his increasing cardiac capacity and general comfort. Details of these diets have been described elsewhere in this volume (D. Murray Lyon, p. 115) and need not be repeated, but the following short table which describes portions of food which produce 100 calories is a useful and simple guide in the preparation of diets. Many green vegetables salads, and fruits of low caloric value can be given in average servings without being weighed.

FOODSTUFF.	AMOUNT PRODUCING 100 CALORIES.
Milk - - - - - -	5 oz.
Skimmed milk - - -	9 oz.
Cream - - - -	$1\frac{1}{2}$ oz.

FOODSTUFF.	AMOUNT PRODUCING 100 CALORIES.
Butter	$\frac{1}{2}$ oz.
Egg	1 (average weight 2 oz.).
Bread	$1\frac{1}{4}$ oz., average slice 3 by 4 by $\frac{1}{2}$ in.
Potato (boiled)	$3\frac{1}{2}$ oz., one large potato.
,, (chips)	$\frac{3}{4}$ oz.
Cheese, ordinary hard	$\frac{3}{4}$ to 1 oz.
Cornflakes	1 oz.
Shredded wheat	1 biscuit.
Beef or veal cooked, lean	2 oz., large serving.
,, ,, ,, fat	$1\frac{1}{3}$ oz., small serving.
Mutton or lamb	$1\frac{1}{2}$ oz.
Bacon, uncooked	$\frac{1}{2}$ oz.
Chicken	1 oz.
Fish	2 to 4 oz., the smaller value for "fat" fish such as herring, mackerel, salmon ; the larger value for white fish such as cod, plaice, sole, halibut.
Beans or green peas, cooked	3 oz.
Dried fruits: apples, apricots, figs, prunes, dates	$1\frac{1}{4}$ oz.
Banana without skin	$3\frac{1}{2}$ oz.
Cherries, apples, pears	5 to 7 oz.
Grape-fruit	7 oz.

HYPERTENSION AND VASCULAR DISEASE

Hypertensive subjects vary considerably in type and in the symptoms they present. Some lean, nervous individuals with blood pressures tending to vary rapidly according to their emotional states may well live for the normal duration and are unaffected by dietetic restrictions.Others, obese and plethoric, with a constantly high blood-pressure, may earlier present symptoms of cardiac insufficiency, and the treatment of their obesity on standard lines often reduced their blood pressure and improves their cardiac activity as the strain of hypertension and obesity is lifted. Some patients are much disturbed by giddiness, headache and even the more severe forms of hypertensive encephalopathy. Lastly there is the group in which hypertension is associated with other diseases, such as nephritis, nephrosclerosis, diabetes, pituitary or adrenal

disease, but in these cases the treatment must be mainly that of the underlying disease.

On the whole dietetic restriction is not effective in permanently reducing high blood-pressure, though small degrees of improvement can be registered. Over-nutrition should be avoided and many patients, other than those with obesity, are individuals who habitually eat and drink and smoke too much and who prefer to indulge their appetites for forty-eight weeks each year and then retire to a continental spa where the dietetic regime of the "cure" produces a lowering of the systolic blood-pressure by about 20 mm., after which the patient returns to his original habits. Continued but reasonable diet restrictions will reduce the strain on renal and cardiac functions. If the kidney has not been hopelessly damaged drastic reductions in the diet are unnecessary and would only add to the burden carried by that characteristic figure of the time—the just over middle-age man still beset with emotional and business worries. The patient's make-up must be studied ; thus, for example, it may be therapeutically correct to prohibit alcohol but it may be much wiser merely to limit the intake. The protein intake should generally be restricted to little more than basal requirements, say 70 to 80 grammes a day which can be prescribed approximately by limiting the consumption of flesh food (of any kind) to one meal a day. One egg may be allowed. Plenty of green vegetables and fruit should be given. Salt-free diets have been recommended but it is probably sufficient to restrict the intake of salt by complete omission of added salt rather than by choice of foods of low salt-content. Alcohol should be prohibited if possible and stimulants containing caffeine such as tea or coffee should either be avoided or else taken in very reduced strength.

In cases of hypertension with obesity gradual weight reduction should be effected by the usual dietetic methods.

When symptoms, such as headache, giddiness, and insomnia become troublesome, or when relatively sudden increases occur in the level of the blood pressure the patient should be put to bed and fed on two pints of milk per day with fruit juice feeds for a few days. When the symptoms diminish, the diet is increased at first by the addition of non-protein foods, such as green vegetables and fruit, and then later the normal restricted diet described above is adopted.

It is important that patients should realize that so-called cures at spas and other establishments are not as effective as reasonable moderation in living through the whole year.

BLOOD DISEASES

Of the many disorders of the blood pernicious anæmia and microcytic anæmia are both capable of treatment by appropriate diets. In the case of the former, however, although complete control of the condition in the majority of cases can be obtained by the older method feeding a large daily quantity of liver it is now quite unnecessary so to load a diet with a strongly flavoured food of which the palate soon tires, because the patient finds it easier and less bothersome to take liver extract by mouth or to be treated by injections of one of the many highly potent liver preparations.

In microcytic anæmia, whether due to reduced absorption of iron, the consequence of a chronic gastritis or an achlorhydria, or to a reduced intake of iron, as in the dietaries of the poor, or to the extra demands of pregnancy, the immediate indication is treatment by administration of large doses of iron in the form of one of the many effective preparations. When thereafter the hæmoglobin of the blood becomes normal, dietetic regulations will allow the patient to maintain normal hæmoglobin values.

Adults require an intake of 13 to 15 mgm. of iron per day but it is probable that women of the child-bearing age,

especially during pregnancy, should be provided with an intake of 18 to 20 mgm. daily. According to some estimates it has been calculated that at least 30 per cent. of the population consume a diet which contains less than the minimum requirement of iron. This dietary deficiency of iron is the more marked the poorer the section of the community which is under consideration. Special attention should therefore be given to the diets of patients in these groups and to pregnant women in order that they should not lack this constituent. It is probably unnecessary to prescribe fixed diets either for the prevention or the treatment of such anæmia so long as the diet includes a sufficiency of those food substances which contain the more significant amounts of iron. A list of such substances is therefore appended with their approximate content of iron. It will be noted that the most valuable substances from this view point are the dried legumes, liver, green vegetables, certain fruits, meat, and eggs.

	MGM. OF IRON PER 100 GRAMMES.
Lentils	8½
Kidney	8
Molasses	7
Liver	6
Dried peas	5½
Oysters	4½
Almonds, hazel-huts	4
Oatmeal	4
Spinach	3½
Prunes, dates, figs	3
Olives	3
Beef	3
Eggs	3 (equivalent to 2 eggs).
Cocoa	3
Beans, broad or baked	2
Cabbage, brussels sprouts	1
Asparagus	1
Dried apricots or peaches	1

CHAPTER XII

DIET IN KIDNEY DISEASE

By ROBERT PLATT, M.D., F.R.C.P.

ALTHOUGH the results of dietetic treatment in kidney disease are often uncertain and never immediate there is a fair amount of agreement on the principles which should govern the treatment of the various types of nephritis. Nevertheless, speaking as a physician who has considerable experience of kidney disease, I should say that the occasions on which I order a strict diet are rarer than those on which after examination of the patient I am able to say that strict dieting is unnecessary, and that the meatless regime that has already been followed for many months may now be relaxed. It may therefore be profitable to consider the common misconceptions with regard to diet in nephritis.

First of all it must be clearly understood that a meatless or even a protein-free diet will not prevent albuminuria in the same way that a suitable diet will clear up glycosuria in the diabetic. Albuminuria is only an indication of the existence of kidney disease and may not even be that. If a diet is ordered for the patient it is with a view to treating the disease, and not because it has any direct influence on the amount of albumin in the urine. Albuminuria as a symptom should never be treated until its significance has been fully determined.

The first object should therefore be to make an accurate diagnosis and the two most common mistakes are treating young persons as cases of nephritis when they have actually

only a functional albuminuria ; and treating middle-aged or elderly patients as renal cases when they are actually suffering from essential hypertension. In the first group the history is of the utmost importance and also the presence or absence of casts and the variations in the albuminuria at different times of the day. In the second group (hypertension) only a small minority ever suffer from renal insufficiency. They can usually be distinguished by their pale, unhealthy appearance and the fact that they have lost their concentration power. Elderly patients with hypertension, who can excrete a morning urine with a specific gravity of 1,020 or over, have practically never any serious renal disorder. The renal group (nephrosclerosis) are younger than the ordinary cases of hypertension and their albuminuria is more constant and profuse. There is no evidence that cases of essential hypertension without renal disease benefit in any way by restriction of protein in their diet, and in those who are overweight it is much more important to give plenty of protein and restrict the fat and carbohydrate.

The second common error in the dietetic treatment of nephritis arises through confusion between the functions of the kidney and those of the stomach. In the treatment of gastric disorders the form in which the food reaches the stomach may be of first importance, but by the time the end-products of metabolism arrive at the kidney for excretion it matters little whether they were originally derived from the protein of egg, fish, meat, or cheese. It is therefore wholly irrational to forbid the patient to eat meat and allow him to take an equal amount of protein in other forms.

Finally, the administration of the correct quantities of salt and fluid to patients with nephritis is often at least as important as the regulation of their protein intake, a fact which is still not fully appreciated in practice.

CORRECT DIAGNOSIS AND DIET

As the importance of correct diagnosis cannot be over-emphasized, a brief summary of the chief diagnostic points will be given before describing the dietetic treatment of each type of nephritis.

ACUTE FOCAL NEPHRITIS : *Children or young adults ; hæmaturia and casts but no œdema or rise in blood pressure ; occurs during an infective illness such as tonsillitis.*

In acute focal nephritis the treatment of the causative infection is all-important. In the early stages the diet will consist largely of fluids as in all pyrexial illness. No special diet directed to the renal lesion is necessary, but it is usual to give a light diet with no meat until the hæmaturia and albuminuria have cleared up. This usually occurs as soon as the infection has been overcome.

ACUTE DIFFUSE NEPHRITIS : *Children and young adults ; albuminuria and hæmaturia ; œdema of varying severity, never extreme ; rise of blood pressure often temporary, sometimes pronounced with headache and convulsions ; frequently occurs from one to three weeks after tonsillitis or scarlet fever.*

In the early stages of the diffuse form of acute nephritis food and fluid intake should be reduced to a minimum. A good diet for the first few days, or even for a week, is one pint of orange juice daily and nothing else. Even when vomiting is a symptom at the onset this diet can usually be tolerated, and when there is actual anuria for twenty-four hours or more it is still better to keep the patient on a reduced fluid intake. There is plenty of water in the body to be excreted if the kidneys can be made to work, and the giving of extra fluid is not necessary and only increases the œdema. In favourable cases the blood pressure falls and a diuresis occurs after the first few days and the œdema rapidly subsides. When the

acute stage is over, and in the mildest cases from the commencement, the diet should consist almost entirely of carbohydrate foods, no salt, and a restricted amount of fluid. Milk, containing as it does almost equal amounts of carbohydrate, protein and fat with a great deal of water, is obviously not a suitable food to be given in unlimited quantities.

The following diet may be used for mild or recovering cases of acute nephritis. The quantities apply to adults and should be somewhat less in the case of children.

BREAKFAST :	5 oz. milk. Oatmeal, toast, marmalade. 2 oz. tomatoes.
MID-MORNING :	Half an orange.
LUNCH :	6 oz. potatoes and greens (not peas or beans). Yorkshire pudding. Milk pudding. 4 oz. fluid (e.g. water or lemonade).
TEA :	Toast, butter, jam. Cake. 3 oz. fruit. 4 oz. tea with milk.
SUPPER :	Biscuits, bread, butter. 4 oz. salad. 4 oz. fluid (e.g. water or lemonade). No salt to be eaten or cooked with the food. No extra fluid.

When the œdema and hypertension have disappeared and the albumin has been reduced to about half to one gramme per litre, a more normal diet may be resumed by the addition of meat, fish, or chicken at one of the meals, and a larger quantity of fluid. Cases running an unfavourable course despite treatment are dealt with under subacute and latent nephritis.

SUBACUTE NEPHRITIS : *Usually young adults ; may follow acute nephritis or commence insidiously ; pronounced albuminuria and œdema ; persistently raised blood-pressure ; rapid unfavourable course.*

Subacute nephritis is one of the most serious forms of kidney

disease. As a rule there is no hope of cure and it is therefore hardly justifiable to add to the patient's discomfort by ordering a greatly restricted and unpalatable diet. So long as there is œdema, salt should not be given and the fluid intake should be restricted. Most patients can manage comfortably on 25 to 30 oz. of fluid per day. In this calculation all fruit is reckoned as fluid. In those cases which show an early tendency to uræmia, protein should be restricted and the diet will then be similar to that given above for acute nephritis. In cases running a longer and more gradual course, i.e. resembling nephrosis rather than nephritis, protein may be given in normal amounts provided that the blood urea or non-protein nitrogen is not raised (see next section).

NEPHROSIS : *Children and young adults ; pronounced albuminuria and œdema ;* no *hæmaturia ;* no *rise in blood pressure ; insidious onset ; chronic course with little or no tendency to uræmia.*

In the dietetic treatment of nephrosis by far the most important item is the restriction of salt and water. On the other hand, as nitrogen excretion is normal, there is no reason to restrict the protein in the diet. Since the patient is losing large quantities of protein in the urine and this leads to a reduction in the plasma protein which in turn gives rise to or increases the œdema, it is rational to give these patients protein in more than the usual quantities. Another feature of the illness is that fatty substances accumulate in the blood. For this reason most authors advise a diet low in fat. The following diet fulfils these principles.

BREAKFAST :	5 oz. tea or coffee, with skimmed milk. 4 oz. fish. Bread and marmalade.
MID-MORNING :	One small orange or apple.
LUNCH :	Oysters, if procurable. 4 oz. lean meat or chicken. Peas, beans or lentils.

	Milk pudding.
	3 oz. fluid.
TEA :	5 oz. tea, with skimmed milk.
	2 oz. fish or lean meat.
	6 oz. salad or fruit.
SUPPER :	4 oz. fish or lean meat.
	Vegetables, salad or mushrooms.
	5 oz. tea or coffee, with skimmed milk.

No salt to be cooked or eaten with the food. No extra fluid.

LATENT NEPHRITIS : Some patients after an attack of acute nephritis are left with considerable albuminuria but no œdema. Many of these slowly progress towards chronic nephritis, their blood pressures gradually rising during a period of months or years. In other cases albumin is found accidentally and investigation shows that it is associated with signs of commencing renal insufficiency. These also progress into chronic nephritis. For such cases the term "latent nephritis" is convenient and descriptive, for they have no symptoms. Their treatment has to be ambulatory and little can be done to stop the disease advancing. If they are already showing signs of renal failure dietetic treatment should be on the lines indicated in the next section.

RENAL FAILURE : Renal failure is usually first indicated by loss of the power to excrete a concentrated urine. The specific gravity becomes fixed at about 1010. The urine is usually pale and excretion goes on by night as much as by day. Renal œdema is not seen in this type of case, but there may be cardiac œdema if hypertension co-exists, as it usually does. The end-result of renal failure is accumulation of waste products in the blood, giving rise to the symptoms of uræmia. Renal failure is chiefly seen in the following cases :—

(1) Chronic nephritis in young adults, often the result of previous acute nephritis, but sometimes apparently arising primarily.

(2) Nephrosclerosis (malignant hypertension) occurring

usually at the age of 40 to 55; no previous history of nephritis, but often a family history of hypertension or "Bright's disease." Distinguished from simple hypertension by the signs of renal failure.

(3) Renal failure occurs as the end-result of any disease which causes severe damage to both kidneys, e.g. polycystic kidney, some cases of pyelonephritis.

In renal failure the disease has already long passed the stage when recovery is possible. The object of treatment is therefore to give the patient a diet which reduces the need for urinary excretion to a minimum and therefore to delay as long as possible the development of uræmia. The kidney in these cases has no difficulty in the excretion of water. Polyuria in fact exists and with the excretion of excess of water, salt is also lost from the body. Water and salt must therefore be supplied in adequate quantities, and the patient's own desires are usually a sufficient guide to the amounts. The remainder of the diet should consist almost entirely of carbohydrate food. Some cases run a very slow course and do not show any increase of blood urea or non-protein nitrogen for months or years. To them a certain amount of protein must be supplied to replace wear and tear of tissues. This can be done by adding a small amount of protein-containing food at one meal per day. The following diet fulfils these conditions.

Breakfast:	Weak coffee or tea, with milk.
	Porridge or cereals, with milk.
	Bread or toast and butter, marmalade.
	Half an orange or grape-fruit.
Mid-morning:	Biscuits.
Lunch:	Potatoes and vegetables (not peas or beans).
	Yorkshire pudding.
	Milk pudding or custard.
	5 oz. fruit.
Tea:	Tea, with milk.
	Bread, butter, cake, jam.
	8 oz. salad.

SUPPER :	5 oz. fruit. Bread and butter (or biscuits). No meat extracts. Sugar as desired. Fluids, such as water, soda-water, lemonade, *ad lib.*

After three or four weeks (with the doctor's permission) add to the above 2 oz. meat, fish, chicken, game, ham or cheese, at one meal only each day.

In cases of threatened uræmia (high blood-urea, vomiting) it is advisable to restrict the diet to water, fruit and glucose only for several days. If the patient has not been treated previously this will often reduce the blood urea, relieve the symptoms and give the kidney, so to speak, a fresh start. If the diet above is then rigidly applied, a long time may elapse before uræmic symptoms arise again. When uræmia occurs in a patient who has already had prolonged and adequate dietetic treatment the limits of useful therapy have been reached.

URINARY INFECTIONS: The ketogenic diet, which was a great advance in the treatment of *Bacillus coli* infections a few years ago, has now been supplanted by mandelic acid therapy. As a rule the mandelic acid salt, supplemented, if necessary, by ammonium chloride, produces a urine of sufficient acidity. In some patients, however, it is difficult to obtain an acid urine, especially if their diet is such as to leave an alkaline residue. For these cases the following acidifying diet is suggested (Coombs, *et al.*, 1937) :—

BREAKFAST :	Porridge or cereal with sugar and cream. Bacon and egg, bacon and kidney, or fish. Bread and butter.
LUNCH :	Meat, chicken or fish, or omelette (cheese or savoury). Stewed prunes and cream. Bread and butter. Cheese and biscuits.
TEA :	Mininum of tea with sugar and cream. Bread or toast with butter, or egg or sardine sandwiches.

SUPPER : Meat or fish or cheese.
Bread and butter.
Walnuts.
Minimum of coffee with cream and sugar.

This diet can also be used in the treatment of other conditions whenever an acid urine is desirable.

Reference

Coombs, H. I., Catlin, C. H., and Reader, D. (1937) : *Lancet*, **1**, 1043.

CHAPTER XIII

DIET IN NERVOUS AND MENTAL DISORDERS

By WILLIAM SARGANT, M.B., M.R.C.P.
AND
RUSSELL FRASER, M.B., M.R.C.P.

IN the treatment of nervous and mental disorders great emphasis is now laid on the value of psychotherapy, while little attention is paid to the metabolic abnormalities that may also be present in any individual case. This attitude to treatment is reflected in the wide recognition at present being given to the numerous bodily changes that can be brought about by mental conflicts. As a result, it is apt to be forgotten, especially by those psychologically inclined, that the converse also applies, and that alterations in metabolism can profoundly influence mental phenomena. Diet has a prime influence on metabolism and, as such, its variation may bring about interesting mental changes. That mental symptoms are found in pellagra is an excellent example of this, and it is common to see the night terrors of children with rickets rapidly disappear when the correct diet is prescribed. The extent, however, to which diet may be found to influence many of the commoner psychoses and neuroses has been quite inadequately investigated in recent years by workers with the modern methods of research at their disposal. Practitioners also tend to disregard the part a faulty diet may play in their patients' symptoms. When confronted by the unreasonable and irritating conduct of an hysteric who for months has been picking at her food and losing weight, the improvement in behaviour which results

from correcting the nutrition is often forgotten in the feverish hunt for obscure psychological causation. Weir Mitchell achieved excellent results by giving his neurotic patients large quantities of digestible fluid nourishment, combined with stimulating massage, and undoubtedly his cures have been too readily ascribed to suggestive effects. Moreover, the success attending the "nature therapists," the vegetarians, and other dietetic specialists, whose clientele is composed so largely of similar neurotic patients, may be partly due to the greater attention they pay to physical treatment and constutional abnormalities of their patients.

The neurotics often have physical abnormalities in their constitution which, as even Freud has emphasized, may handicap them in combating emotional strain. They are frequently thin and readily tend to lose weight under stress. Digestive upsets, such as bilious attacks, indigestion, constipation and colitis, are common. Some patients readily develop dietetic deficiencies, due either to inadequate absorption of food, or to defects in its utilization by the body. Individual constituents of the diet may be poorly metabolized and this is occasionally responsible for the mental disorder present. As an example of this last type of defect, Gjessing has recently shown that certain persons liable to recurrent attacks of schizophrenia cannot metabolize the average quantity of protein taken by a normal person. On ordinary diet they periodically develop nitrogen retention concurrently with their attacks of insanity. Treatment which eliminates this tendency to retention of nitrogen has induced complete and unexpected recovery in very chronic cases.

GENERAL MANAGEMENT OF DIET IN NERVOUS DISORDERS

In the treatment of nervous patients, owing to the inadequate state of present knowledge of nutrition, the practitioner is

largely limited to simple measures based on general principles. Before prescribing any dietetic treatment it is important to inquire into the patient's previous dietetic habits, his tendency to alimentary upsets, and especially into any recent changes in weight. Even if no abnormalities requiring correction are elicited, a determined attempt should generally be made to improve the nutrition of asthenic individuals ; and when there is significant loss of weight, or a history of a badly balanced diet, this should always be corrected.

It is important that the diet ordered is not avoided by various subterfuges. When this is a special problem, complete confinement to bed with the supervision of a nurse may sometimes be necessary. A weekly weight-chart should also be kept, and any significant loss in weight while on the prescribed diet generally indicates the need for closer supervision ; occasionally, however, it points to the development of some hitherto unexpected complication, or a decided deterioration in the patient's mental condition.

In the severe cases with obvious nutritional defects a regime similar to that for peptic ulcer can be instituted as the first stage for treatment. The following has been found satisfactory for this purpose :

Diet "A"

Milk mixture to be made up daily—
84 oz. of milk.
3 teaspoonfuls of Horlick's.
3 teaspoonfuls of sugar.
One salt tablet of 20 grains.

6 a.m.	Orange drink (orange juice 2 oz., sugar 1½ oz., water 4 oz.).
8.30 a.m.	20 oz. of milk mixture. 2 eggs (mixed with milk mixture). 2 oz. of "digestive" biscuits.
12 noon	20 oz. of milk mixture, mixed with Bemax, 1 oz. ; 1 egg. Halibut-liver oil 20 minims, mixed in 3 oz. of milk mixture.
4 p.m.	21 oz. of milk mixture flavoured with coffee. 2 oz. biscuits.

7 p.m. 20 oz. of milk mxture.
2 eggs mixed with milk mixture.
2 oz. of biscuits.
9 p.m. Orange drink as at 6 a.m.
This comprises—P.115 F.123 C. 400 grammes. Total Cals. 3,275.

An advantage of this diet is that it can be taken by many patients who will take little solid food because of their feeling of fullness after even small solid meals. Further it can be readily measured by the nurse or relatives, and the doctor is assured that his patient, if taking this, receives 3,200 calories, which is well above the requirements of a person in bed. It should be persisted with not only till the maximum gain in weight has occurred, but usually for a further fortnight. When it is decided to discontinue the diet, there should be a gradual transition to the usual convalescent peptic ulcer regime for a week or so before returning to normal food.

For those whose condition renders a fluid diet imperative, it is important to see that the food taken is somewhat more appetizing and digestible than usual, and that its constituents are well balanced. The constituents of a normal well-balanced diet need not be discussed here. But special allowance must be made for idiosyncrasies discovered by the history, though this does not mean that every whim of the patient should be satisfied. Alcohol, caffeine, and other stimulants should only be allowed in moderation, and the prescription of complicated diets, patent foods, and other advertised remedies is generally unnecessary. The diet prescribed need not be represented to the patients as something mysterious and specific for their illness, but they should always be made aware of the value of adequate nutrition and the necessity of choosing food that they are capable of digesting during the acute stage of their illness.

Unfortunately, a large dietary intake in the more severe psychoses does not necessarily result in increase of weight during the acute phrase of the illness. The real reason for this

is not known, but it is a common observation that such patients often lose weight during their illness and put on weight as a first sign of their impending recovery, though the dietary intake has remained unaltered throughout. Although it is not easy to restore the nutrition of these patients, every effort should be made to maintain it, if possible, as this seems to accelerate the other processes of recovery. In patients not eating sufficient, despite persuasion, nutrition should not be allowed to deteriorate before instituting nasal feeds or arranging admission to hospital. The following is a suitable nasal feed to be given twice daily if no other food is taken :—

Milk 30 oz.
2 eggs.
Sugar 2 oz.
Horlick's ½ oz.
Marmite 1 teaspoonful to alternate feeds.
Juice of one orange—prepared separately.

For nasal feeding stiff rubber tubes of bore 12-14 should be used. The patient's head is bent forward and the jaw held up to avoid the point of the tube entering either the mouth or the larynx. If the patient obstructs this, two nurses may be required to restrain the arms. With these precautions the tube should pass readily into the stomach, but if there is any uncertainty it should be partially withdrawn and re-inserted. If the above technique is followed, the distressing procedure of gagging open the mouth and using an œsophageal tube should never be required. A small quantity of water should first be poured down to ensure that the tube is in the stomach. Aperients and sedatives may be added to the feed if desired.

DIETETIC TREATMENT OF PRIMARY AND SECONDARY ANOREXIA

As the efficacy of any diet ordered depends so largely on the patient's desire to eat, the discussion of anorexia merits a place

in this article. It would seem that there is considerable confusion in the application of the term anorexia nervosa. It is frequently used to cover any case of severe anorexia and loss of weight with mild nervous and mental symptoms. In reality such cases fall into two distinct main groups which are distinguished as primary and secondary anorexia. Primary anorexia is a distinct clinical entity, whereas anorexia which is only a complication of another psychiatric disorder is termed secondary anorexia. This differentiation is important since the two types vary both in the prognosis and in the therapeutic approach. A careful physical examination and a detailed investigation of the mental state is generally necessary to place a case in its correct group. The patient should always be asked to explain why he does not take his food. In secondary anorexia he may say for instance that his food is poisoned, that he is not worthy to eat it, or that food does not interest him : there may be delusions relating to the function of the digestive tract, or hallucinatory voices commanding him not to eat. Secondary anorexia can be a prominent symptom in such varied psychological conditions as anxiety neurosis, obsessional disorder, depression, schizophrenia and hysteria ; and the great majority of the functional anorexias fall into this group. Treatment of secondary anorexia is on the lines laid down in the previous section and, except in the severe psychoses, this should result in rapid gain in weight, while the mental symptoms sometimes benefit surprisingly.

One such patient, for instance, had been suffering from obsessional symptoms for over four years, during which she had had periods in hospital and psychotherapeutic treatment with little relief. Within two months of being put on the special diet quoted above, and thereby gaining 1½ stone in weight, she made a complete recovery from her nervous condition.

Primary anorexia or anorexia nervosa is distinguished from secondary anorexia by many physical and mental features. The physical findings include severe emaciation, low blood-

pressure, blue and cold extremities, obstinate, constipation, complete amenorrhœa, low basal metabolic rate, a dry, papery skin, and often a growth of new, downy hair on the extremities and trunk. Such a combination of physical findings is rarely, if ever, found in secondary anorexia. The mental state is also characteristic, being one of mild depression, associated with a striking degree of over-activity in spite of extreme emaciation. On examination it is found that the aversion to food is not secondary to other psychological abnormalities but dominates the symptomatology. Every sort of trick is employed to avoid eating, just as any individual might do if compelled to eat a seven-course dinner three times a day. In this condition, more than any other, it has been found that fluid diet can be taken more easily than solid food. The patient should be confined to bed and the fluid diet "A" detailed on p. 157 should be prescribed; it must always be taken under observation as their own reports of food intake are rarely trustworthy. Every effort should be made to obtain the patient's co-operation for this therapeutic regime; and it should be remembered that they are often antagonized by a careless disregard of their anorexia which to them is such a genuine symptom. Tube feeding is almost always contra-indicated in this condition as it spoils all rapport between the patient and the physician. This regime will need to be continued for some considerable time to obtain the maximum improvement possible.

Evidence is now accumulating to suggest that anorexia nervosa is not entirely a "functional" condition in its fully developed form, and is probably associated with a dysfunction of the pituitary gland. Supporting this view, we have found that even when diet is adequate and has been taken over a prolonged period, recovery is slow and by no means always complete. The weight may be only partially restored, and

amenorrhœa, constipation, low basal metabolic rate and circulatory changes frequently persist after a dietetic regime seems to have achieved its maximum benefit and the patient's mental state has shown significant improvement. As yet knowledge of the pathology of this interesting condition is inadequate to supplement dietetic treatment by measures which will improve their apparent incapacity to utilize the food taken. Various thyroid, pituitary, and ovarian preparations are being tried at the Maudsley Hospital, but so far without satisfactory results.

In all patients suffering from severe anorexia, attention to details of diet may also be supplemented by measures designed to improve the appetite itself. Complete rest during the acute phase of the illness and gradually increasing exercise as recovery occurs are important. Convalescence in a different environment may be necessary. Bitter tonics may be tried in the more resistant cases, but these are rarely effective. For the thin and asthenic patient insulin 10 units t.d.s. given half an hour before meals often helps both the nutrition and the appetite.

DIETETIC TREATMENT OF ANXIETY STATES AND MILD DEPRESSION

Normal degrees of anxiety and depression lead both to loss of appetite and the adoption of an inadequate and badly balanced diet. Under-nutrition results and this aggravates both the anxiety symptoms and the anorexia. A vicious circle is thus formed which must be broken at all costs, especially in those who have to continue working during their illness. A short rest or a small amount of carbohydrate before meals often helps to restore the appetite. In severer cases glucose or similar drinks should be given between meals, but this should only be regarded as a temporary expedient, since the excessive preponderance of carbohydrate in the diet which may result is undesirable. We have found that adequate attention to the

nutrition in these conditions may mean the difference between a short illness with recovery and return to work, and a long period of incapacity requiring hospitalization, or at least entailing cessation of work.

THE TREATMENT OF HYPOGLYCÆMIC ATTACKS

Spontaneous hypoglycæmic attacks occasionally produce symptoms resembling anxiety neuroses, or even sometimes simulate other and severer forms of mental disorder; for instance, a patient recently admitted to Maudsley Hospital was mistakenly diagnosed for some time as catatonic schizophrenia. In the milder and more common variety, there is weakness accompanied by periodic slight disturbances of consciousness; palpitations and other anxiety features are often present during the attack. The symptoms always come on after a period of starvation and are immediately relieved by the taking of carbohydrate. This relationship to food is the essential clinical feature, and if adequately proved is of more diagnostic importance than isolated blood-sugar estimations. Depending on the severity, these attacks can be relieved in one of three ways. In the milder forms small carbohydrate meals should be interspersed midway between three normal meals which should be of the usual mixed character. For severer cases a high-fat diet should be instituted (C.100, F.200, P.70) at approximately three-hourly intervals from 6 a.m. to 10 p.m. If symptoms still persist in the early morning, an additional meal of milk and biscuits should be given at 2 a.m. The reason for a high-fat diet is that it diminishes the basic abnormality of this condition by decreasing insulin-production and insulin-sensitivity, and when the meals are given sufficiently frequently their carbohydrate content will be adequate to abort any attacks that begin to develop. If both these dietary measures fail, more detailed investigations are required and an explora-

tory operation for adenoma of the islands of Langerhans is generally indicated.

DIET IN OTHER NERVOUS DISORDERS

Space does not permit a full discussion of many other nervous conditions in which nutrition may be of special importance. Most of these are well known and need little emphasis. The value of diet in *epilepsy* has recently provoked much discussion. Alow-meat intake, restriction of fluids, or a ketogenic diet have all been reported as lowering the incidence of fits, but little agreement exists on the relative merits of these measures, except that they are not as important as adequate drug treatment.

It is now recognized that vitamin deficiency plays an important part in the production of *peripheral neuritis* and the *toxic cerebral disorders* of the Korsakow type, especially those due to pregnancy and alcohol. The deficiencies concerned are vitamin B, especially B_1, vitamin A, or both together, and it is best for the purposes of treatment to assume deficiency of both vitamins in all such cases. Halibut-liver oil 10 minims t.d.s. and a yeast preparation, such as marmite, one teaspoonful t.d.s. should be prescribed. The failure of diets rich in vitamin to relieve these symptoms may, in some cases, be due to an alimentary upset preventing vitamin absorption. It is then necessary to give the vitamin by the intramuscular route. Vitamin B_1 can be given in doses of 1–2,000 international units twice or thrice weekly, and five to thirty doses may be needed. Unfortunately vitamin A is not yet available in injection form. Modern techniques for demonstrating vitamin deficiencies have not so far been applied to the greater number of the neuroses and psychoses, but clinical experience would suggest that such deficiencies are frequently present. For example, cases of anorexia nervosa and prolonged depression sometimes show pellagroid features; but the less severe

deficiencies, that are probably more common, require special investigations to demonstrate their presence.

The dietetic treatment of *hyperpiesia* is of importance in controlling this disorder which is so often responsible for the mental symptoms seen in elderly patients. This has already been discussed in other chapters. *Migraine* is another condition which sometimes responds to dietetic treatment. Occasionally the attacks are precipitated by individual articles of food, such as eggs and chocolate, and subjects of migraine are helped by a regular and well-balanced diet, even if idiosyncrasies have not been elicited.

CONCLUSION

It must not be thought that the dietetic treatment stressed in this article can replace a sympathetic and rational approach to the patient's psychiatric difficulties, and their treatment by discussion, suggestion, or the more intensive methods of psychotherapy. Whatever may prove to be its ultimate place in the treatment of mental disorders, psychotherapy is often the most effective method in the present limited state of knowledge. But undoubtedly in some quarters the pendulum has swung too far in the direction of a purely psychological approach and led to the neglect of other lines of investigation and treatment. However, it is to be hoped that the segregation of psychiatry from general medicine will soon be a thing of the past. A more balanced view and a greater insight into the problem of mental disorder should inevitably result.

CHAPTER XIV

DIET IN ALLERGIC DISEASES

By GEORGE W. BRAY, M.B., Ch.M., M.R.C.P.

In the choice of a diet for an allergic patient, the existence of food allergy is implied, and so it is necessary that a few of the general principles regarding allergic reactions to foods should be understood. In the first place the foods responsible are wholesome and normally well-tolerated. In the present discussion only the symptoms which occur on their ingestion are referred to, as local reactions on the skin may follow from contact such as the eczema of the housewife or baker from handling flour; or nasal or asthmatic symptoms may follow the inhalation of dusts from cereals, coffee, or cocoa, or even from the steam or odours of cooking. Secondly the subject is also limited to specific sensitivity to definite foods as shown by symptoms following ingestion, freedom on elimination, and confirmed possibly by skin reactions or a blood leucopenia or eosinophilia following ingestion.

Diet may affect allergic individuals in other non-specific ways—(*a*) large meals or the production of excess of gas may distend the stomach and cause reflex vagal irritation and so excite or accentuate asthmatic symptoms; (*b*) insufficiency of acid in the gastric juice may delay or inhibit digestive processes so that imperfectly digested proteins gain access to the blood stream; for it is known from experiments that it is the whole molecule or the earliest split-products of the foods that cause symptoms and that the specific amino-acids are devoid

of any allergic activity ; and (*c*) in the presence of gastro-intestinal disease or even on normal membranes certain foods, such as pepper, mustard, alcohol, some fats and certain fresh fruits and vegetables, may set up mucosal irritation and aggravate symptoms. Consequently when a patient gives a long and varied list of foods that cause symptoms it is wise to investigate the digestive processes first rather than specific food sensitivity. Thirdly, specific food-sensitization may be the only factor in some cases and in others merely a contributory factor, as, for example, in aggravating hay-fever symptoms in the summer months, but causing no symptoms at other times of the year. For experience has shown that most people exhibiting the allergic group of diseases are multi-sensitive and the causative substances usually belong to different groups, some being inhaled, others causing symptoms following injection, infection, or contact in addition to those causing trouble on ingestion.

Finally, once a number of foods have been determined by skin tests or elimination diets, further difficulties may arise because—(*a*) only some of the foods to which patients give positive skin reactions cause symptoms. The cooking processes may change some so that large amounts may be taken without producing symptoms, whereas others produce attacks even in the minutest quantity, possibly because they are taken raw, or only lightly cooked, or taken into an empty stomach ; (*b*) some foods causing symptoms may give negative skin reactions, possibly due also to some alteration during the cooking or digestive processes ; (*c*) one food alone may not cause symptoms, but when two or three such foods are taken on the same day symptoms ensue due to a summation effect, hence patients seem to be able to take a certain food one day and not another ; (*d*) others only show symptoms when the body resistance is lowered following exertion, chilling, illness, mental and nervous upsets, or during lowered states of basal metabolism ;

and (*e*) most allergic conditions have a cyclical recurrence, waves of greater and lesser susceptibility appearing to follow one another.

The allergic symptoms after the consumption of specific foods may appear immediately or be delayed up to two or three days, probably due to a variable speed of absorption. One is frequently told that allergic symptoms have followed the taking of alcohol. The alcohol *per se* is rarely the cause of symptoms, but it readily dissolves partially decomposed proteins, so that absorption of substances of high molecular weight is accelerated by alcohol. As these earlier products are the commoner causes of allergic symptoms, this rapid absorption explains the greater tendency to reactions after alcohol. One food may cause one type of allergic symptom, and another food a different symptom. They may cause urticarial swellings of the mucous membrane at the point of contact or a variable number of manifestations on their absorption. The older ideas of liver dysfunction playing an auxiliary part in these food allergies may need to be revised drastically as most recent evidence points to the absorption of the offending proteins through the lymphatics of the gastro-intestinal tract and their passage through the thoracic duct directly into the venous system and the heart, and thus explaining the rapid onset of symptoms in some cases, which would not fit in with existing knowledge of a sluggish circulation through the liver capillaries.

Thus in view of the manifold difficulties that beset any discussions of diet in allergic diseases, it is necessary to conclude that, however scientific the background, protein skin-reactions, passive transfer experiments, eosinophil counts or leucopenic indices following certain foods, the practical outcome is really one of trial and error. Again, food sensitivities may change over months or years as certain foods are dropped and larger amounts of others taken.

To assist in the detection of these food allergies there are four common and practical methods of approach: (*a*) the food addition method, beginning with a simple innocuous food and gradually adding others and noting symptoms; (*b*) the food diary method, keeping a list of all foods taken and marking when symptoms occur and attempting to correlate them with articles of diet taken at the time; (*c*) the trial diet (Bray), which excludes all the commoner causes of allergic reactions; and (*d*) the elimination diets of Rowe.

ADDITION DIETS

The intestinal tract is cleansed with calomel and Epsom salts. The patient is placed on one food, preferably such a meat as lamb or mutton, which hardly ever causes allergic symptoms, for three days. Another food is added each twenty-four hours unless a reaction occurs which resembles some of the symptoms under investigation. A list of the foods is kept and those to which the patient reacts are eliminated from the diet. Another suggestion is to give pure sugar, 300 grammes a day in weak tea, for a two-day period, with the patient in bed. Successive simple food additions are made at twenty-four hour intervals. Others have suggested milk alone, or a vegetarian diet excluding all animal proteins, as the basic diet, but both are quite common causes of symptoms.

FOOD DIARIES

The patient is instructed to make a record of all foods eaten in a twenty-four hour period, and any symptoms experienced are noted. The method is somewhat tedious, but it reveals cases in which symptoms are produced by a combination of foods when one alone does not produce symptoms.

TRIAL DIETS

If skin tests are not available to determine causative foods, the

simplest procedure for the practitioner to adopt is the prescription of a diet which is free from the common causes of asthma. In such a diet wheat, barley, and oats should be avoided as much as possible, and the remaining cereals should be employed after heating, puffing or toasting. It should exclude egg and foods containing egg, especially egg-white. In many cases egg-yolk, if freed from white, can be used. The albumens of the eggs of various birds are similar antigenically, so it is impossible to substitute other eggs for hens' eggs. It should avoid cows' milk in its natural state. The lactalbumin is commonly the part that leads to the reactions and, as it is heat-coagulable, if the milk is well boiled, cooled, and the coagulated scum removed, it can frequently be tolerated. Allergilac (Cow and Gate), is a lactalbumin-freed, half-cream, acidified dried milk that is applicable in cases of milk sensitivity. Condensed and evaporated milks can be used sometimes, as they have been modified to some extent by prolonged exposure to heat. Vegetable "milks," which can be made from soya-bean flour, are useful at times. In a milk-free diet all milk products should be excluded—butter, cream and cheese. Some patients can tolerate the milk of one animal and not of another. Apparently the lactalbumin is specific for each animal. Caseins of all milks, however, contain a common antigen, though slight differences may exist in each one. Hence cows' milk lactalbumin-sensitive patients can frequently tolerate goats', asses', mares', or ewes' milk. In place of butter, salted bacon or chicken fat, or pure almond or peanut butter can be used.

The diet should exclude beef, and especially pork, ham, bacon and lard. It should also avoid many other less common foods that do not agree with asthmatics, such as shellfish, nuts, cocoa and chocolate, fruits such as fresh strawberries, apples and bananas, and vegetables such as beans and peas, potatoes

and tomatoes, cabbage and celery. Such a basic diet for an allergic child is set out below and it is easy to modify it for an allergic adult. The patient is placed on the diet until free from symptoms, then one of the excluded foods is added each few days until symptoms recur, when generally the latest addition is the causative food. But this does not mean that it is the sole food, for patients are generally multi-sensitive so that the process must be continued until all the excluded foods are reintroduced except those that lead to reactions.

BASIC DIET FOR AN ALLERGIC CHILD

Breakfast

Vitamins: Some concentrated preparation such as adexolin, ostelin, or radiostoleum. Orange juice, grape-fruit.
Cereal: This should be made with water, covered with prunes or other cooked fruits and their juice, and sweetened. The following are advised in this order of preference—tapioca, sago, arrowroot, rice (boiled, puffed, toasted flakes, or "crispies"), rye (crisps or toasted flakes), corn (flakes or "post-toasties").

In place of wheaten bread—ryvita crispbread, oatmeal biscuits, or very thin crisp toast. "Buttered" when cold, and covered with honey, treacle, or syrup.
Beverage: Allergilac (Cow and Gate), or a small cup of warm weak tea, with a small teaspoonful of condensed or evaporated milk.

Dinner

Soup: A small quantity of clear, sieved bone and vegetable soup.
Meat: Lamb chop, grilled or stewed, or roast lamb. Brains. Chicken or other poultry. Occasionally steamed or boiled fish.
Vegetables: Sweet potato, turnip, carrot, sprouts, squash, artichoke.
Salad: Beet-root, lettuce, watercress, or asparagus tips covered with oil or lemon juice.
Sweets: Baked or stewed pears, peaches or apricots. Custard made from powder, not egg. Fruit jellies. Tapioca or other pudding, cooked with water, not milk. Dates or dried figs, soaked in water for forty-eight hours.

Tea

Soup: Bone or vegetable or other clear soup.
Cereal: Ryvita, oatmeal biscuits, or crisp toast, with butter or margarine, and honey or seedless jam.
Sweet: Stewed fruit or fruit jelly, or other simple dish prepared with gelatin.
Beverage: Allergilac. Tea with condensed or evaporated milk.

Cohen, Wallace, Mallory and Rudolph (1933) have devised a milk-, cereal- and egg-free diet for allergic infants. It is put up in liquid form by Mead, Johnson & Co., under the name of "Cemac." The same firm puts up the soya-bean milk, "Sobee," devised by Hill and Stuart (1929). Balyeat, Rusten and Bowen (1933) have published a book on egg-, wheat-, or milk-free diets with recipes and food lists.

ELIMINATION DIETS

These diets were first suggested by Rowe (1928) for the diagnosis and treatment of cases of food allergy. It has been long recognized that many cases showing allergic reactions to foods did not give positive skin tests, or in other cases when positive skin-reactions were produced, treatment based on the results failed, in some cases, to alleviate symptoms. For these patients, as well as for those in whom skin reactions cannot be undertaken, these diets are of use.

It is essential that no foods other than those specified in the list are used unless it should happen to contain a food to which the skin reactions are positive or a known specific idiosyncrasy exists. Calories may be increased by plenty of sugar or by increasing the quantity of the oil or starch prescribed. Symptoms are relieved by the correct diet in from five to fourteen days; should relief not occur by this time one of the other diets should be tried and some articles of the previous diet suspected. With relief an article from the other diets may be added every four to five days; suspected foods should be excluded and tried again in another few weeks. It is best to add the fruits and vegetables first, then the cereals and meats. Milk may be tried in three or four weeks, but in children and thin adults it may form the initial diet. If the continued exclusion of milk is necessary, care must be taken to administer both calcium and vitamin D.

ROWE'S ELIMINATION DIETS (1935)

	Diet 1.	Diet 2.	Diet 3.	Diet 4.
CEREAL -	Tapioca Rice	Corn Rye	Tapioca White or sweet potato	Milk, 2 to 3 quarts a day Tapioca cooked with milk and milk sugar
BREAD -	Rice biscuit Rice bread	Corn pone Corn rye muffin Rye bread Rye crisp	Lima bean Lima bean bread Potato bread Soya bean	
MEAT -	Lamb	Chicken Bacon	Beef Bacon	
VEGETABLES -	Beet Carrot Lettuce Spinach Artichoke	Squash Asparagus Tomato String beans Peas	Beet Carrot Tomato String beans Lima beans	
FRUITS, JAMS, DRINKS	Lemon Grape-fruit Pears	Pineapple Prunes Peaches Apricot	Lemon Grape-fruit Peaches Apricot	
MISCELLANEOUS -	Cane sugar Cotton-seed oil Olive oil Salt Gelatin Syrup from maple sugar or cane	Cane sugar Cotton-seed oil Mazola oil Salt Gelatin Karo corn	Cane sugar Cotton-seed oil Olive oil Salt Gelatin Syrup from maple sugar or cane	

Failure in food elimination experiments may be due to many factors. In the first place, elimination may have been incomplete; for example, a person sensitive to pig foods may eat foods roasted in lard, or a person sensitive to egg take cake, meringue or baking powder. Secondly the period of exclusion may have been too short, since the effects of an incorrect diet may persist for weeks or months. Thirdly, the multiplicity of reactions or the effect of summation in each individual

may not be appreciated. Fourthly other sensitizations, such as inhalant or contact, may need control as they may maintain symptoms originally produced by foods alone. Finally the patient's general resistance needs building up by correction of digestive disturbances, clearance of septic foci, or the raising of the general body metabolism by endocrine therapy.

In conclusion it may be said that the best diet for an allergic individual apart from the avoidance of specific food sensitivities, is one that (*a*) is simply compounded as regards its proportions of fats, proteins and carbohydrates, and not excessive in any respect; (*b*) is well cooked to destroy any allergic properties as far as possible, but not recooked or fried to render it indigestible; (*c*) of small but nutritious bulk so as not to cause gastric distension and the consequent vagal irritation; and (*d*) taken as early in the day as possible so that the major digestive processes are completed before night, when most allergic conditions tend to be more pronounced.

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CHAPTER XV

DIET IN DERMATOLOGY

BY H. W. BARBER, M.B., B.CHIR., F.R.C.P.

THERE is still a difference of opinion among dermatologists the world over as to the importance of diet in the etiology and treatment of diseases of the skin. Many, while admitting that urticaria may depend upon food-sensitization, and that acne may be aggravated by chocolate, and excess of fatty foods generally, consider that dietetic therapy is of little value in dermatological practice. Others, on the other hand, follow Brocq and the physicians of old in regarding the faulty digestion and assimilation of food as the paramount factor in the causation of many skin eruptions and associated symptoms. In assessing the right and the wrong in these two opposing views the obvious point must be stressed that the dietetic factor is greatly influenced by a person's mode of life and environment. Certain eruptions may temporarily disappear when the patient, without altering his diet, changes his sedentary indoor life for an outdoor one with regular exercise, but he may also recover by restricting his diet without altering his mode of life. Those who are sceptical about the importance of diet and exercise in dermatological treatment should remember that trained athletes of intelligence, who study their diet carefully, seldom suffer from skin diseases except those due to accidental infection or trauma. Without further stress on this point, the fact may be emphasized that a dietary which is not unreasonable for a person living an active outdoor

life may be grossly excessive for one whose life is entirely sedentary.

It is proposed to consider the disorders of the skin that may either result from a wrongful dietary alone or combined with other factors, or may be favourably influenced when these faults are corrected. Chief attention will be paid to two main groups of such disorders—the seborrhœic and the allergic. The effects of hypovitaminosis upon the skin will not be considered, but one fact, which is often not realized, may be mentioned, namely, that pallor of the skin, not due to anæmia, is sometimes indicative of vitamin D deficiency.

THE DIETETIC TREATMENT OF SEBORRHŒA AND ITS COMPLICATIONS

In so far as seborrhœa and its secondary complications of infective origin can be controlled or benefited by dietetic treatment, the main principles of such treatment are simple. Excess of fat, of concentrated carbohydrate foods, and of alcohol undoubtedly aggravates seborrhœic conditions, and it is only necessary to contrast the smooth dry skin of the ascetic, accustomed to regular fasting and whose intake of food is often inadequate, with the greasy, flushed, and pimply complexion of the gourmand to realize how important the dietetic factor may be. Moreover, all have seen the gradual development of seborrhœa and seborrhœic eruptions in athletes who adopt a sedentary life, limit their exercise to a round or two of golf during the week-end, but eat richer food and drink more alcohol than when they lived an active life of outdoor sports.

Certain foods appear particularly harmful, such as white bread, cane sugar, chocolate, pastry, cream, and, in some cases, cheese. Sabouraud (1922) long ago emphasized the influence of excessive consumption of bread, which many

people eat mechanically at meals which are otherwise adequate or more so, and he claimed remarkable results from merely omitting it altogether without other restrictions. I have been struck by the enormous consumption of cane sugar by certain persons, particularly by those who drink large quantities of tea. I have had patients who consume from thirty to forty lumps of sugar per diem, apart from quantities of bread, cakes, and sweets. The influence of this excess of carbohydrate upon the skin and mucous membranes will be discussed later, but I am convinced that it is often the most important predisposing factor in sycosis barbæ. It is generally agreed that chocolate almost invariably aggravates acne, as also sometimes do cheese, cream, and, perhaps, pig-fat. For the seborrhœic—and, indeed, for the normal healthy person—the staple dietary should consist of lean meats: liver, kidney, sweetbread; fish, boiled, steamed, or grilled (if fried the outer covering should not be eaten); poultry (by the seborrhœic, goose and duck are best avoided); crisp wholemeal toast, or alternatives to bread, such as vita-weat or ryvita; a moderate quantity of butter; crisp cereal foods; milk (for seborrhœic patients excess of cream should be removed); mixed salads *ad lib.*; cooked vegetables, which should be steamed, and not boiled in water; and plenty of fresh and cooked fruits. Sugar and salt should be taken in strict moderation. To be avoided are: ordinary white bread and toast, porridge, pastry, puddings of all kinds, rich cakes, sweets, chocolate, jam, marmalade, pork, sausages, bacon, re-cooked meat dishes, rich sauces, fatty foods (except butter), and cheese.

The above dietary provides ample choice, excludes foods of excessively high caloric value, and is sufficiently rich in vitamins. Unfortunately, however, few English cooks know how to cook vegetables, and the supply of fresh meat and raw vegetable salads is inadequate in the average household. Many

patients complain that the dietary is insufficient, partly because they have become accustomed to fill themselves with stodgy and concentrated carbohydrate foods, and partly because the person responsible for the catering for the household, either through ignorance or on the grounds of economy, does not utilize the variety of foods that the dietary allows.

THE ALLERGIC GROUP OF ERUPTIONS

I should prefer to use the term "toxic idiopathies," coined by Freeman, rather than "allergic" eruptions, for under the latter heading should be included the tuberculides, trichophytides, syphilides, and streptococcides, but nowadays most medical men understand by the term "allergic subject" a person who, usually from childhood, is subject to a group of symptoms which includes one form of infantile eczema, the eczema-prurigo of Besnier; urticaria and angio-neurotic œdema; certain types of eczema, pruritus, and prurigo appearing after infancy and childhood; paroxysmal rhinorrhœa (including "hay-fever"); asthma; migraine; certain gastro-intestinal disturbances; paroxysmal hydrarthrosis; and probably epilepsy.

It is with this group of disorders that this section is alone concerned. One characteristic of the allergic subject is the tendency for one or more of his tissues to become sensitized to various allergens, such as food-substances, plants and their pollens, the hair or dander of animals, numerous chemical substances, and even physical agents such as heat, cold, and light. As might be expected, the particular allergens to which a person is, or becomes, sensitive depend to a considerable extent on his environment. An interesting point is that in some cases on changing an allergic subject's surroundings, e.g. by admission to hospital, he may cease to have attacks of his

disease, although exposed freely to the allergen which provokes it.

Apart from this tendency to hypersensitiveness, the allergic subject is characterized by a lack of balance of the endocrine-autonomic system—usually an underaction of the sympathetic and of the accelerator glands, with consequent vagotonia; by a tendency to retention of fluid with sudden mobilization in one or other tissue; and by the frequency with which psychological disturbances and an uncongenial environment are of major importance in the production of his symptoms. I propose to deal only with the question of retention of fluid and its dietetic treatment.

THE ANTI-RETENTIONAL DIETARY

One of the most important factors in the etiology of many non-specific diseases is a tendency to retention of fluid. It has received too little attention in this country. The subject is of great complexity and for detailed discussion of it reference should be made to the writings of Földes (1933). Here it will suffice to present the barest outline.

The principal conditions in which fluid-retention plays an important part, according to Földes, are uræmia, epilepsy, eclampsia of pregnancy, the exudative diathesis, rickets, and eclampsia of infancy, the allergic group of diseases, e.g. migraine, urticaria and angio-neurotic œdema, paroxysmal rhinorrhœa, certain forms of asthma, eczema, and prurigo; angina pectoris; gout; essential hypertension; certain hæmatological diseases such as pernicious anæmia and polycythæmia; acne vulgaris; and certain nervous and psychical disturbances.

The number of symptoms that may occur with fluid-retention depends to a great extent upon the particular organ or tissue in which the retained fluid is chiefly localized. Thus,

in uræmic convulsions, epilepsy, eclampsia, and migraine, it is in the brain and meninges; in urticaria in the dermis; in angio-neurotic œdema in the hypoderm; in eczema in the epidermis; in paroxysmal rhinorrhœa in the nasal mucosa.

It has long been known that in many cases of migraine, for example, in the period preceding and during the attacks there is oliguria, and at the end of the attack a profuse diuresis (urina spastica). Oriel and I (1928) showed that in allergic subjects certain definite biochemical changes occur in the blood and urine before, during, and after the paroxysms or crises of their particular symptoms—the pre-paroxysmal, paroxysmal, and post-paroxysmal periods. In the first two periods there is oliguria, and the urine is highly concentrated, hyperacid, and contains a heavy deposit of urates: in the post-paroxysmal period there is diuresis and the urine is very dilute, neutral or alkaline.

Heilig (1924) and others have shown that if water or salt are given during menstruation they are eliminated more slowly than during the inter-menstrual period, and there is an increase of body-weight due to retention of liquid; it is known that migraine and other allergic symptoms are usually intensified during menstruation. The same is true of many cases of acne.

The importance of fluid-retention in the various conditions cited is confirmed by the effects of an anti-retentional dietary and other therapeutic measures designed to bring about elimination of fluid and mineral salts. The principles of the anti-retentional dietary are much the same as those established by Czerny in the treatment of the exudative diathesis. Whereas proteins, and particularly nucleo-proteins, cause increased elimination of water, excess of carbohydrates and fats predisposes to its retention. A diet poor in protein may lead to the development of œdema, and the œdema of infants fed on

a carbohydrate-rich, protein-poor dietary is well recognized. The diuretic effect of a protein-rich diet is doubtless in part due to urea, and nucleo-proteins contain purine bases which are chemically closely related to the caffeine group of diuretics. The anti-retentional diet, therefore, should contain a relatively high proportion of protein and nucleo-protein, with restriction of carbohydrates and fats. Green vegetables and fruits can be given freely. Naturally it is necessary to restrict the fluid-intake and the consumption of sodium chloride. As examples of anti-retentional dietaries, the following, taken from Földes' book, can be cited:—

Breakfast.—One glass of orange juice; 100 gm. of liver, or kidneys, or sweetbreads, or sardines (oil to be removed); 30 gm. of bread, one glass of water.

Lunch.—Tomatoes, lettuce, cooked vegetables; 30 gm. of bread; 150 gm. fruit; one glass of water.

Dinner.—180 gm. lean meat, or poultry; or 200 gm. fish; or 100 gm. fish and 100 gm. meat; salads and vegetables; 30 gm. bread; 150 gm. fruit; one glass of water.

Before retiring.—One glass of milk.

(*Note:* 1 ounce = approximately 30 gm.)

This dietary contains 82 gm. protein, 150 gm. carbohydrate, 38 gm. fat, 0·27 gm. purine nitrogen, and 1,200 c.cm. of liquid, allowing 400 c.cm. for the orange juice and fruit.

Breakfast.—One glass of orange juice; 30 gm. toast; one cup of coffee (200 c.cm.) with one tablespoonful of cream and a tablespoonful of sugar.

Lunch.—100 gm. of calf liver; lettuce and tomatoes; 60 gm. bread; 150 gm. of fruit.

Dinner.—150 gm. of meat or poultry, or 180 gm. fish; salads and vegetables; 60 gm. bread; 15 gm. cheese; 150 gm. fruit.

Before retiring.—One glass of milk.

For twenty-four hours: three glasses of water.

This diet contains 82 gm. of protein, 185 gm. of carbohydrate, 35 gm. of fat, 0·17 gm. of purine nitrogen, and 1,400 c.cm. of liquid.

The menus for the different meals may be interchanged, and in practice the amounts of the different foods may be varied provided that the relative proportions are maintained fairly accurately.

Numerous examples of the effects of an anti-retentional dietary in the different diseases under discussion are given by Földes. It will be observed that the principles of the anti-retentional dietary are much the same as those advocated in the treatment of seborrhœic conditions. Földes considers that an important factor in acne vulgaris is retention of water and minerals, and increased chloride retention in the skin. Certainly there is retention of fluid in many seborrhœic patients, as may be roughly determined by comparing the fluid-intake with the output and specific gravity of the urine. Apart from the anti-retentional dietary, diuretics may temporarily be used with advantage. Földes advises calcium salts, and prescribes calcium carbonate or, if there is achlorhydria, the lactate. I often give large doses of potassium citrate, combined with potassium carbonate if there is urinary hyperacidity. In severe cases of allergic diseases it is often advisable to begin treatment with the Karell diet, namely, four tumblers of milk per diem and no other food or liquid, providing, of course, the patient is not milk-sensitive. Fruit may be added to this after two days, and later an anti-retentional dietary enjoined. As in seborrhœic patients one of the most effective treatments for patients with allergic symptoms is a completely outdoor life, but it must be remembered that they are usually at first intolerant of cold, and particularly of east winds, which paralyse their already underactive thyroid-adrenal-sympathetic system.

THE TREATMENT OF CERTAIN ERUPTIONS DEPENDENT UPON INTESTINAL TOXÆMIA

It is not intended to discuss the merits or demerits of that once fashionable term "intestinal toxæmia," which admittedly has been used too frequently and often as a cloak for ignorance. Nor is it proposed to discuss the nature of the substances, which, when intestinal toxæmia does exist, are responsible for

the symptoms of toxæmia. They unquestionably differ in different cases, and may be derived directly from intestional bacteria or from the action of bacteria upon undigested food. The practical point is that many banal reactions of the skin, e.g. pruritus, urticaria, eczema, and prurigo, may in certain cases be provoked by toxic substances absorbed from the bowel and not destroyed or altered by the liver. I believe, too, with Whitfield that there is a group of cases of psoriasis in which intestinal toxæmia is the provoking factor. In these, as Whitfield pointed out, marked indicanuria is found, and the administration of intestinal antiseptics, particularly creosote, may cause the psoriasis to disappear.

The treatment of cases in which there is presumptive evidence of intestinal intoxication should depend upon the results of certain investigations, e.g. an examination of the stools for undigested food-residues, for abnormal bacteria, and for evidence of excessive putrefaction or carbohydrate fermentation. If there is constipation, it is essential to determine its cause by an X-ray examination of the intestinal tract, since thereby it can be discovered if there is any marked delay in the lower ileum, cæcum, or colon, if the constipation is due to dyschezia, and if diverticulitis or other abnormalities are present. It is also important to know if there is gastritis and if the gastric secretion is normal.

At any rate the rational treatment of the group of cases under discussion must depend to some extent upon the results of laboratory and X-ray examinations. If, for example, there is evidence of excessive intestinal putrefaction, with, perhaps, the presence of large numbers of abnormal late-lactose-fermenting coliform organisms in the stools, a strict lacto-vegetarian diet is indicated for a while, e.g. :

Three or four tumblers of milk per diem, sweetened with lactose.
Steamed vegetables, if necessary as purées.

Mixed salads.
Cooked and raw fruits sweetened with lactose of glucose.
Crisp wholemeal toast, vitaweat or ryvita with butter and other crisp cereals.

The administration of cultures of *Bacillus acidophilus* with lactose in the early morning is often of value.

If, on the other hand, incomplete digestion of starch, with excessive fermentation, appears to be the chief fault, it is clear that soft farinaceous foods should be excluded. These cases, as a rule, do well on an anti-retentional dietary (*see* p. 181).

As regards intestinal antiseptics, the efficacy of which has been much disputed, I believe they are of value in some cases, probably because they may limit bacterial growth in the small intestine. Creosote, given in capsules, has seemed to me the most effective, and the observations of Whitfield tend to confirm its value.

In all cases regular abdominal exercises, combined at first, perhaps, with massage, should be enjoined, unless, of course, the patient's physical condition would render them dangerous. If laxatives are necessary at first, they should be non-irritating and should not produce fluid stools except temporarily. Dyschezia must, of course, be treated according to the factors which appear to be responsible for it.

To sum up, the ultimate aims in these patients should be: (1) To restore completely the tone of the abdominal and intestinal muscles, and to get rid of excessive abdominal fat. (2) To ensure complete daily evacuation of a normally formed stool. (3) By dietetic and other therapy to aid the complete digestion of all three classes of food-stuffs, and to produce a normal intestinal flora.

OTHER DIETS IN DERMATOLOGY

References may be made to two other methods of dietetic treatment employed in the treatment of certain diseases of the

skin, one being the so-called Sauerbruch-Hermannsdorfer-Gerson (S.H.G.) diet, which has been advocated chiefly for tuberculous conditions, particularly lupus vulgaris of the skin and mucous membranes, and the other the Grütz diet for psoriasis.

THE SAUERBRUCH-HERMANNSDORFER-GERSON DIET

The essentials of this dietary are:—

(1) The almost complete exclusion of sodium chloride, a compound, rich in calcium but poor in sodium, being used as a substitute.

(2) Liberal quantities of uncooked fresh vegetables as salads, with added fruit-juices, and extracts prepared by pressing uncooked vegetables.

(3) The cooking of vegetables in their own juices with little water.

(4) Moderate restriction of meats.

(5) Restricted water-intake, but liberal amounts of the juices of fresh fruits and vegetables.

(6) The administration of mineral compounds containing the lactate and phosphate of calcium, and double salts of calcium and magnesium; strontium, aluminium, and silica in colloidal albumin combination; and cod-liver oil.

(7) A high fat- and protein-intake, but a marked restriction of carbohydrates.

It will be seen that the main principles of the diet are the restriction of common salt, a liberal supply of other mineral salts and of vitamins, particularly A, D, and C, and a relatively high protein- and fat-intake, but a low carbohydrate one. In many respects it is similar to an anti-retentional dietary. Its value in tuberculous conditions is generally admitted; but, as might be expected, it has also given good results in acute inflammatory non-tuberculous eruptions, such as acute eczemas and erythrodermias. Unfortunately it is usually impossible to prescribe the dietary in its entirety to ambulatory patients of the hospital class for obvious reasons

THE GRÜTZ DIET

Grütz (1934) suggested that psoriasis, like xanthomatosis, may be a manifestation of faulty fat-metabolism. Employing

Bürger's cholesterol-tolerance test, he found that the total serum fat was on the average increased by about 40 per cent. in psoriatics. He therefore treated a series of patients with diet as a sole therapeutic measure. The diet contained as a maximum 20 grammes of fat for an adult and 10 grammes for a child, and was continued for long periods.

FORBIDDEN

All fat-containing soups; sausages; all sorts of fat meat, such as pork, and fatty poultry (goose, duck), fat fish, such as herring and salmon, and all fish roe; egg yolk; all cheeses; all fats (bacon, lard, dripping, margarine, oil, cream, butter, butter-milk); cakes, tarts, whipped cream, shortbread.

Meat may be roasted with just a little butter, but the gravy must be allowed to cool and the fat taken off the top. The fatty coverings of fried fish or cutlets must not be eaten.

ALLOWED

Soups poor in fat—soups from which the fat has been scooped off on cooling; egg white; lean beef (roast beef, boiled beef), lean mutton and lamb; lean veal, lean game (hare, venison), lean ham, liver, kidney; lean poultry (pigeon, fowl, partridge); lean fish, for example, haddock, sole, cod, whiting, turbot; sugar, honey, fruit juice; all fruit, marmalade, and jam; flour, rice, semolina, groats, potatoes, macaroni, vermicelli; all vegetables, but prepared entirely without fat; salads *ad lib.* without oil; wholemeal bread or toast, vitaweat, ryvita, rusks.

This method of treatment appears to be based upon a wrong conception of the etiology of psoriasis, and it is seldom of value. Moreover, it may adversely affect the patient's general health. As might be expected, the over-fed, obese patient with psoriasis, in whom the eruption often has chiefly a flexural distribution, may benefit greatly, but in such subjects it is more rational to restrict both fats and carbohydrates, and to limit the intake of alcohol to a minimum.

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CHAPTER XVI

DIET IN RHEUMATISM AND GOUT

By CHARLES W. BUCKLEY, M.D., F.R.C.P.

THE diets which are appropriate for those who suffer from the various forms of rheumatism or gout, while possessing some features in common, present even greater diversities. It is necessary to take into consideration not only the type of disease, but also the general constitutional condition; the soil is often more important than the seed in these conditions.

It will save repetition if the introductory chapter in this book by Professor V. H. Mottram is studied carefully in this connexion. The "body-protecting foods" call for special consideration in rheumatoid arthritis particularly. No attempt will be made in the present article to discuss the calorie value of the different articles of food deemed to be desirable in the diet, as full information will be found in the paper referred to. Pemberton advises that the diet for a patient with rheumatoid arthritis of average weight should approximate to a value of thirty calories per kilogramme of body weight and this is a useful guide. It is a good plan to ask the patient to describe in detail the composition of the various meals he or she habitually takes, not overlooking the possibility of food taken between meals in the form of chocolates or biscuits. A rough estimate of the probable calorie value can then be made and the necessity for reduction, if any, can be determined.

CLASSIFICATION AND GENERAL CONSIDERATIONS

It is desirable to recognize five different types of disease

each presenting different metabolic characters:—

Acute rheumatism or rheumatic fever, rheumatoid arthritis, osteo-arthritis, fibrositis, gout.

The confusion which existed until a century ago between rheumatism and gout still persists to a great extent among the laity. The theories of "acidity" based on the acid sweats of rheumatic fever and the hyper-uricæmia of gout have led to a multiplicity of systems of diet, some purely fanciful and some pseudo-scientific, and even to-day dietetic fads and fancies are more widely practised than dietaries based on scientific principles.

It is difficult to estimate the harm that has been done by the theory of acidity in relation to fruit in the diet. The organic acids contained in fruit, such as malic and citric, are completely oxidized in the body and excreted as CO_2 and water. Fruits furnish the most readily available source of vitamin C and the deficiency of ascorbic acid in the blood of patients with acute rheumatism or rheumatoid arthritis is evidence of the necessity for fruit in the diet of these diseases.

Idiosyncrasies are, however, commonly met with and careful inquiry must be made for them. It is well known that strawberries, for example, disagree with some people and set up urticaria and other allergic symptoms, of which those of fibrositic type are important in considering the diet of rheumatic subjects. Strawberries readily undergo fermentative changes if over-ripe or not freshly gathered and the disturbances they set up sometimes may be due to this cause. It may be found that an individual can eat freshly picked fruit, without the usual addition of sugar and cream, with impunity, whereas fruit from the shop or the coster's barrow which may have been gathered twenty-four hours or more sets up troublesome symptoms. Rhubarb is often condemned, sometimes on account of idiosyncrasy, sometimes from distaste, but more

often on account of its reputed acidity. It must be noted that rhubarb contains oxalic acid and those prone to oxaluria will be liable to suffer from this after eating rhubarb as well as after some other fruits.

It is impossible to enumerate all the possible idiosyncrasies, but apples, for example, which are a valuable constituent of the diet for most people, disagree with some and I have known patients who attributed both rheumatic and gouty symptoms to eating apples or drinking cider, whereas others regard cider as the ideal beverage for the rheumatic or gouty. It is a popular idea that the colour of meat is a guide and that red meat should be avoided in rheumatism as well as in gout. The fallacy of this idea in general application was aptly illustrated by the late Dr. Burney Yeo, whose advice to a patient subject to gout was, "If there is a turkey on your table, boiled because it was too old to be roasted, and a sirloin of beef with a nice undercut, you will do better to choose the sirloin."

ACUTE RHEUMATISM

In acute rheumatism during the febrile stage the diet must be that suited to febrile conditions in general but with due attention to the deficiency in ascorbic acid in the blood to which reference has already been made. From available evidence this deficiency is the result rather than the cause of the infection and it has been found that the amount of ascorbic acid required to raise the level in a normal individual to saturation point is much below what is required to produce the same effect in one suffering from acute rheumatism or rheumatoid arthritis. It seems probable that there is an increased destruction of this vitamin owing to a greater metabolic demand. There is, however, no definite evidence as yet that vitamin C (ascorbic acid) has any curative effect on the disease. It is well therefore to supplement the diet in acute rheumatism by

plentiful supplies of fruit juices, and orange juice is generally readily available and appreciated by the patient. Lime juice and lemon juice will also be useful alternatives and grapes have an established reputation as an addition to invalid diet.

Milk must be the staple and variations may be made by using it as the basis of vegetable soups as well as in the form of milk puddings and custards. When given alone it is often better tolerated if citrate of sodium is added in the proportion of two grains to the ounce, or it may be diluted with an aerated water. Cereals in various forms, vegetable purées and broths are generally permissible at an early stage, wholemeal bread or plain biscuits serve as a vehicle for butter, and honey is often an acceptable addition.

RHEUMATOID ARTHRITIS

In dieting patients with rheumatoid arthritis it is safe to proceed on the principle that this is a disease due at least in some measure to an infective agent. The exact nature of the infection need not be considered here, but it may be noted that it is probably one of low virulence in most cases and therefore only able to obtain a foothold where the soil has been prepared by various other factors, of which the inheritance of a certain type of body tissue is one of the most important. Of the others malnutrition is from the present point of view the most important and may be due to defects in the kind of food taken rather than in the total quantity. It must not be overlooked that the food available may be ideal in quality and ample in quantity and yet malnutrition may ensue as a result of defective digestion due to such causes as achlorhydria and constipation.

Pemberton (1929) has drawn attention to the frequency with which an elongated, tortuous and kinked colon is met

with in arthritis and Arbuthnot Lane also made important observations on this point. Constipation is an almost invariable accompaniment and may be present even when there is a daily action of the bowels. In such cases digestion will be imperfect and assimilation poor, while the production and absorption of toxic substances due to bacterial action on the retained material may play an important part in rendering the tissues susceptible to infection.

It is desirable therefore in dieting rheumatoid arthritis to investigate these possibilities. Evidence of achlorhydria should be sought for; a test meal followed by analysis of the gastric contents is the most certain method but, failing this, study of the dyspeptic symptoms will often supply a clue. Another method is to determine the pH of urinary samples taken one and two hours before and one and a half hours after a meal. If the pH of the third sample is the same as or less than those of the first two samples it usually indicates the absence of an alkaline tide and therefore probably an achlorhydria.

To perform the test 10 c.cm. of each sample are placed in a test-tube and 10 drops of the appropriate reagent added and the colours compared. Universal indicators or special reagents may be obtained.

The action of the bowels and the use or more frequently the abuse of aperients calls for close inquiry and steps should be taken to remedy the fault, by diet if possible, which may be a most difficult matter calling for the utmost determination by the patient and therapeutic resource on the part of the practitioner. Deficiency of vitamin B in the diet is believed to give rise to atonic changes in the intestinal musculature which may culminate in atonic constipation of extreme degree. It must be remembered, however, that in the early stage constipation may be spastic, especially in the nervous and highly strung type of patient, and intestinal atony may be a later effect induced by the injudicious use of purgatives. There is reason

to believe that the action of vitamin B may be of value in such conditions.

Catarrhal conditions of the respiratory tract are common in rheumatoid arthritis and may be associated with the causal infection if that is located in the teeth, tonsils, or nasal sinuses. Vitamin A is believed to have some influence in raising the resistance to such catarrhs but has no effect upon them when established.

The importance of vitamin C has already been referred to in connexion with acute rheumatism and is equally necessary in rheumatoid arthritis. Vitamin D is frequently deficient in ordinary diets and it is best supplied by means of cod-liver oil of good quality, halibut-liver oil, or one of the special proprietary preparations.

An adequate supply of mineral constituents is of importance in rheumatoid arthritis, especially calcium and iron; phosphorus is also needed but is generally present in adequate amount in the calcium-containing foods. Milk is a valuable source of these salts but patients frequently profess a distaste for it which needs to be overcome by determination; the growing vogue of milk bars tends to make it more popular, with advantage to the community in general. Iron can also be supplied in a judiciously arranged dietary but more easily, though less cheaply, by the pharmacist. A diet which is adequate in other respects is not likely to be lacking in the other mineral salts.

Defective carbohydrate metabolism is usual in rheumatoid arthritis. This is due in some measure to the defective capillary circulation and the muscular atrophy. It is necessary to avoid therefore any excess of carbohydrate in the dietary.

Rheumatoid arthritis is, however, met with in many degrees of severity and types of patient. In the more acute forms in young people the general level of nutrition is apt to be low and

there is often a mild pyrexia, though not of sufficient degree to call for diet restriction. As middle life is approached the patients are generally of a less asthenic type. Although many are underweight, there is a type of arthritic often with extensive crippling, in whom there is a tendency to obesity associated with well-marked absorption of calcium from the bones and its replacement by fat. Such features call for a greater degree of carbohydrate restriction and fats may also be limited. Arthritis of the rheumatoid type sometimes occurs in advanced life and is then associated with arteriosclerosis and senile osteoporosis; milk is valuable in such cases.

The essentials of the diet in rheumatoid arthritis may be summed up as follows:—(1) Restriction of calorie value; this need not be carried to the extremes of a weighed diet and will often be achieved by attention to the next point. (2) Restriction of carbohydrates to a reasonable extent by avoidance of excess of sugar and starchy foods—a useful method is to restrict the consumption of foods made from white flour and to forbid chocolates and sweetmeats. (3) To ensure an ample supply of vitamins in due proportion. (4) To provide a good supply of proteins in the form of the more easily digested kinds of meat, poultry and fish. Liver is of great value in many cases as a source of iron and vitamins. Herrings, sprats, and whitebait are useful as protective foods and also fish-roe. (5) To supply calcium and iron.

The following lists of ordinary articles of food showing their vitamin and mineral content, while not exhaustive, may be useful in drawing up a dietary:—

VITAMIN A	VITAMIN B_1 & B_2	VITAMIN C
Milk	Cereals with the germ	Oranges
Butter	Yeast	Lemons
Cheese	Spinach	Tomatoes
Eggs	Tomatoes	Strawberries
Tomatoes	Peas, raw	Pineapple
Spinach	Beans	Apples

VITAMIN A	VITAMIN B_1 & B_2	VITAMIN C
Lettuce	Milk	Black currants
Bananas	Liver	Spinach
	Lettuce	Lettuce
	Cabbage, raw	Cabbage and most green vegetables

These are not arranged in the order of their strength in vitamins and it must be remembered that much may be lost in the process of cooking but the water in which fruit and vegetables have been cooked will contain much of the lost vitamin and may be used as syrups or as a basis for soups. Cooking with alkali, such as bicarbonate of sodium, tends to destroy vitamin B but if brown sugar is used instead the loss will be minimized.

Calcium and iron may be obtained from the following foods:—

CALCIUM	IRON
Milk, cheese, eggs	Liver, beef (variable)
Watercress, turnip tops	Eggs, cheese
Cauliflower and many green vegetables	Oatmeal, lentils, peas
Lentils, beans, bran.	Spinach
Whitebait, sprats, sardines	Dried fruits
	Golden syrup

It will be noted that certain articles appear over and over again in these lists and these are likely to be valuable constituents of the dietary. It must be remembered that the building and energy-producing articles of food are necessary apart from any of the above special characters they may possess.

In certain types of disease when rest in bed can be secured at the outset of treatment, Pemberton and Osgood (1934), and Dorothy Hare (1937), have advised a drastic reduction for the first few days and have obtained good results from this method. It is not easy to determine the type of case which will be benefited by such a line of treatment and it will be contra-indicated in those patients who are asthenic, with pyrexia and an active septic focus. The patient who is constipated with

evidence of ptosis and probably a loaded colon, who eats well and may be overweight, or may on the other hand present evidences of defective assimilation, will probably react well, especially if judicious colon irrigation is practised at the same time. Pemberton in some of his cases gave nothing but orange juice and water for the first two or three days, thereafter adding gradually to the diet until the level of 30 calories per kilogramme of body weight was reached.

Dorothy Hare proceeded on somewhat different lines and her system may be quoted as it furnishes a sound basis for the dietary in arthritis even though not carried out in its entirety. For a fortnight the patients are placed on a diet of uncooked fruit and vegetables with a moderate addition of raw oatmeal, milk, and cream. A feature of the diet was the reduction of salt to a minimum.

BREAKFAST.—Grated apple, raw oatmeal soaked, grated nuts, cream, an orange, tea with milk and cream.
MID-MORNING.—Tomato purée with lemon.
DINNER.—Salad of various vegetables with a mayonnaise dressing. Fruit salad and cream.
TEA.—Dried fruit and nuts, tea with milk and cream.
SUPPER.—Fruit porridge made of prunes, apricots, or apples, and a salad with dressing.
AT BEDTIME.—Lemon or orange juice with hot water.

After a fortnight on such a diet the following additions were made:—Cooked foods: vegetable soup, one egg, meat 2 oz., bacon 2 oz., bread 2 oz.—Uncooked: butter 1 oz., cheese 1 oz., milk 8 oz. This was continued for several weeks.

Such a diet would require the services of a skilled dietitian to make it palatable and would also be productive of indigestion in some patients, but the results in many cases were encouraging and the principle is worth observation.

The chief features are the high proportion of vitamin C, a bulky diet calculated to stimulate intestinal action, a low proportion of carbohydrates and also of meat. Salt was limited

to the amount used in cooking. Many patients would not tolerate the strict diet of the first fortnight and some modification might be justified; others find the diet indigestible. Definite benefit was experienced in some cases and in suitable patients the regime will be worth a trial.

When such extreme measures are not deemed desirable the following will be a useful scheme of diet.

AN HOUR BEFORE BREAKFAST. A glass of hot water or very weak tea with a slice of lemon.

BREAKFAST.—Any cereal, preferably containing wheat germ, one or two tablespoonfuls, or porridge with a tablespoonful of bemax, with cream, 1 oz. One egg or a rasher of bacon or slice of ham. An apple or orange or other fresh fruit. One round of brown bread or toast about 2 oz., butter ½ oz. Two cups of tea with milk, sugar sparingly if desired.

MID-MORNING.—A light meal for those who cannot take a full breakfast, for example, a glass of milk with a banana, two wholemeal biscuits with butter; or a sandwich of wholemeal bread and marmite and a small glass (5 oz.) of tomato juice.

MID-DAY DINNER.—Clear soup or a vegetable purée; meat of the lighter kinds, or poultry, game, sweetbread or liver lightly cooked with a rasher of bacon, green vegetables or young carrots, *ad lib.*, cooked or raw. Stewed fresh or dried fruit with cream or junket, or fresh fruit or custard or any light sweet, avoiding flour crusts. Two or three wholemeal biscuits, butter ½ oz., cheese ½ oz. with salad, tomato or celery. Lemon or lime squash or orangeade, little or no sugar but saccharin may be used.

TEA-TIME.—Two cups of weak tea with milk or cream; half a slice of wholemeal bread with butter, or tomato sandwiches.

SUPPER.—Fresh fish of any kind except salmon or shell fish (except oysters) or an egg dish with tomatoes, or baked beans, or cauliflower *au gratin*. Fresh fruit stewed or as a salad with cream ½ oz. Biscuits and cheese as at dinner. Half a pint of milk.

AT BEDTIME.—Half a pint of hot water.

Such a diet with average helpings will give about 1,800 calories and is adequate for a patient of ten or eleven stone, but will be found more liberal than is required in many cases and particularly if the patient is kept at rest. Variety is important and many modifications are possible without sacrificing the general principle, while the size of the helpings is an easy way of bringing it into line with requirements.

If the patient tends to obesity Energen bread, Heudebert rusks and gressins, or other special breads of reduced starch content, may be substituted, cream omitted, and sugar replaced by saccharin.

The kind and quantity of meat do not call for special restriction unless there is evidence of putrefactive changes in the colon but it should never be twice cooked and is best taken only at the midday meal.

Stimulants are not required as a rule, but in enfeebled and ill-nourished patients a glass of stout may be permitted with the midday meal, or a glass of equal parts of stout and milk may be taken in the middle of the morning and with the evening meal.

Restriction of salt, as in Dorothy Hare's system, is often effective in reducing swelling especially of an œdematous nature.

OSTEOARTHRITIS

This form is essentially a degenerative process though there may be an infective factor in addition. The arthritis of the knee joints so commonly met with in women at the menopause is generally associated with weight in excess of the normal and the weight adds to the wear and tear on the joints which tends to osteoarthritis. In all patients therefore in whom there is a tendency to obesity the principle will be: restricted carbohydrates and fats and a generally spare diet, with ample fruit and vegetables uncooked when possible. With attention to these points the same general scheme as outlined for rheumatoid arthritis may be adopted. In women it is often important to secure that sufficient fluid is taken and a good plan may be to reduce fluids to a minimum except at tea-time and to prescribe half a pint or more of hot water an hour before each meal and at bedtime.

Some patients will do better to take only three meals a day

making the midday meal light, with dinner in the evening. Since the subjects of osteoarthritis are generally past the meridian, less food is required than in earlier life and an abstemious system of diet is to be encouraged. Although there may be no evidence or history of acute gout the level of uric acid in the blood is frequently above normal and in such cases the diet should be that advised in gout. Meat may well be limited in all cases to one meal a day, fish, egg, or cheese dishes supplying the protein necessary at other meals.

FIBROSITIS

The first problem to be considered in the diet in fibrositis is the etiology. It may be the result of accident or of chronic muscular strain often due to occupation and in such cases it is obvious that diet will not play any part in the treatment. It must be noted, however, that although chronic strain is an important factor in etiology, toxic or infective influences often provide the actual cause which converts the state of chronic strain into an acute attack. When the toxic factor appears to be of intestinal origin or, as is sometimes the case, there is a gouty tendency, diet will be important, and equally so if the patient is overweight. A chronic back pain may be the result of a heavy pendulous abdomen associated possibly with enteroptosis and fæcal stasis, and a strict diet is an essential part of the treatment. If possible the blood should be examined for uric acid and if the level is above 3·5 mgm. per 100 c.cm. in women or above 4 mgm. per cent. in men, the tendency is definitely gouty and the diet should be arranged accordingly.

If the general scheme of diet suggested for rheumatoid arthritis is taken as a basis, three different modifications may be considered; (*a*) In the middle-aged patient, perhaps constipated but not overweight, the indication is to increase the amount of uncooked fruit and vegetable and foods providing vitamin B, to forbid all rich foods, and twice-cooked meats

and to restrict the carbohydrates to a moderate extent. Brown bread should be preferred to white, pastry and puddings except of the simplest kinds forbidden and sugar limited especially in the form of chocolates and sweetmeats. (*b*) If there is a tendency to obesity the restriction of sugar and carbohydrates should be carried further, fluid with meals reduced to a minimum and hot water with a slice of lemon taken an hour before meals. Stimulants should be prohibited. (*c*) When there is evidence of gout the diet will be framed on the lines suited to that disease but, unless the level of uric acid is much above the normal or attacks of acute gout have occurred, it may be rather less strict.

It is generally advantageous to restrict the total quantity of food taken as years advance and elimination becomes less perfect, and especially in the case of those subject to twinges of muscular rheumatism or occasional attacks of lumbago. In such cases and those of the milder gouty type the following general plan will be found serviceable.

ON RISING.—Half a pint of hot or cold water or two cups of very weak tea without milk or sugar but with a slice of lemon if liked.
BREAKFAST.—The juice of one or two oranges or an apple; choice between fish, one egg and a slice of bacon, or one or two slices of cold ham or tongue; toast, butter and marmalade; coffee or tea.
LUNCHEON.—Brown bread, butter, cheese, and a plentiful supply of salad, tomatoes or celery, a simple salad-dressing; any fresh or stewed fruit and a glass of milk. An omelette or any egg or cheese dish may be taken as an alternative first course and cereals or baked beans are other alternatives.
TEA-TIME.—One or two cups of tea with milk and sugar if desired; bread and butter or biscuits in moderate amount.
DINNER.—A clear soup or vegetable purée; a moderate helping of meat, poultry or game with plenty of vegetables of any kind, any simple sweet, a cheese savoury or biscuits and cheese. If a fish course is taken the amount of meat should be less. The best beverage will be lemon or lime squash but a small whisky with soda or plain water may be taken then or later in the evening if desired; it is well to limit it to one.

This may appear to be a limited diet to anyone accustomed to the pleasures of the table but it is quite sufficient for

sedentary people. With average helpings it will approximate to 2,000 calories. If exercise is being taken freely, a moderate increase such as fish in the middle of the day will do no harm, but the nutritive value of the midday meal suggested is higher than might be supposed, and the need which may be created by the increased muscle metabolism will be met better by an increase in the amount of carbohydrates if the subject is not overweight.

GOUT

The pathological feature upon which the diet of gout is based is the excess of uric acid which is present in the blood and the usual principle is to reduce the amount of those foods that are rich in purin bodies. Uric acid, may, however, be present in leukæmia and some other conditions in much greater amounts than are met with in gout, and then does not lead to attacks of gout. Some disorder of the functions of the liver leading to the imperfect metabolism of purins is undoubtedly a factor in the disease but the deposition of the crystalline biurate of sodium in the tissues is due to some other factor as yet undetermined. Nevertheless anything tending to interfere with the functions of the liver will certainly tend to promote gouty attacks and this means rich and indigestible foods and food generally in excess of bodily requirements, and alcohol which acts as a poison to the liver cells thus reducing their power of metabolizing the food substances reaching them by the portal vein. Although alcoholic beverages have this effect, other constituents than alcohol play a part as shown by the fact that beer and the heavier wines, such as burgundy, champagne and port, are more deleterious than the lighter wines and spirits.

In the acute attack the diet must be of the lightest character and ample fluids are essential—water, natural lemonade, weak tea, barley water or mineral waters which do not con-

tain sodium chloride in appreciable amount are suitable; alcohol should be forbidden. Between the attacks the aim will be to eliminate from the diet all foods which are rich in purin bodies, but a moderate amount of protein is of course essential and meat need not therefore be entirely forbidden. There is no reason for preferring white to red meat except that it is usually more digestible; high game must be prohibited. Rich, greasy and highly seasoned dishes, meat soups and meat which has been twice cooked are to be avoided. Recent observations have indicated that an excess of fat in the diet interferes with the elimination of uric acid and thus tends to induce an attack. The following foods may be taken freely being purin-free: milk, eggs, butter, cheese, bread and cereals, fruit of all kinds, nuts, potatoes, and green vegetables. The following contain some purins but may be taken in moderation: chicken, mutton, boiled ham, lightly cooked fat bacon, if not too salt, oysters, white fish, trout, herring, peas, beans, onions, spinach, asparagus. Beef may be allowed occasionally, if tender and sparing in amount, and the same applies to salmon. The following foods should be excluded from the dietary of the gouty: sweetbreads, liver, kidneys, calf's head, pork, sausage, goose, meat extracts. Foods not mentioned may only be taken sparingly unless known to be easy of digestion and purin-free.

Meat should only be taken at one meal a day and a meatless day once a week is a wise plan. The richer forms of pastry and sweets are also to be avoided since they are liable to cause dyspepsia which is a frequent precursor of a gouty attack. Tea and coffee have often been forbidden on the ground that caffeine and theobromine are purin bases; but they are methyl purins which are not metabolized to form uric acid and they may therefore be permitted except that black coffee may have injurious effects in other ways and is therefore only

to be allowed sparingly. Common salt should be restricted, since the sodium salts lessen the solvent power of the serum for sodium biurate and if necessary one of the substitutes now available may be substituted. It is better to avoid alcoholic beverages entirely but when a stimulant is thought desirable, on account of the debilitated condition of the patient or for other reasons, a little well-diluted whisky or gin may be permitted, and the lighter wines, especially if diluted with a mineral water in the continental fashion, are probably harmless if taken with meals in moderate quantity. Cider is thought by some to be safe but this is quite mistaken; beer is definitely gouty. With attention to these specific restrictions the plan of diet laid down for fibrositis will be found to be generally suited to the gouty also. Not less than three pints of fluid should be taken in the day in such forms as water, weak tea, or lemonade made from fresh fruit. Mineral waters may be preferred and those of low saline content are best, such as Malvern, Buxton, or Evian.

Personal idiosyncrasies such as have been referred to at the beginning of this article call for special consideration. It is generally believed that strawberries are liable to cause an attack of gout, this in the absence of a special idiosyncrasy as shown in other ways is probably due to indigestion as a result of the excess of sugar and cream taken with them. Potatoes which are sometimes forbidden are quite harmless and indeed may be beneficial; vegetables and fruit should figure largely in the diet of the gouty individual.

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CHAPTER XVII

DIET IN RELATION TO PREGNANCY AND LACTATION

By MARGARET I. BALFOUR, C.B.E., M.B., F.R.C.O.G.

IT is only within comparatively recent years that the question of a woman's diet during pregnancy and lactation has been recognized as one of primary importance and has received attention from scientific workers. This new outlook is due to the recognition of the fact that the final causes which lead to mortality or morbidity in mother or child may not be the most important causes. A mother may be attacked by infective disease, toxæmia, or other trouble at the time of her confinement or a child may die during the first week of life from some recognized symptom, but the point to discover is why this mother or this child fell a victim while others escaped, or why, having been attacked, death took place while others recovered.

During the past twenty years much light has been thrown on the effect produced by nutrition on health and disease. It has been shown both clinically and experimentally that the growth and well-being of children are hindered by a lack of the "protective" foods and that both in children and in adults diseases of different types may occur owing to certain deficiencies in the diet, these diseases disappearing when the deficiencies are made good. It is reasonable to suppose that what occurs in the ordinary individual occurs also in the pregnant and nursing woman; indeed, it should occur to a much greater

extent owing to the fact that the requirements of the fœtus and of the young infant at the breast call for additional nutriment of various kinds, which is not always forthcoming. As a result of the realization of these facts, much work has been done of late years both in laboratories and in hospitals to discover the effect on pregnancy and lactation when certain elements of food are absent or are deficient in the mother's diet. It must be remembered that the term "malnutrition" means a condition produced by a deficiency in the diet of any important food element and does not necessarily mean poverty. It is frequently found among the well-to-do owing to ignorance or habit, which induces likes and dislikes for certain articles of food. It is well known that the food taken in an ordinary diet is not all used in repairing tissue or in supplying energy and heat. Part is stored up in certain organs of the body to be used as a reserve. Thus iron, glycogen, vitamin A are stored in the liver, calcium in bones, and vitamin B in various internal organs. When the diet of a pregnant woman is insufficient for the needs of the fœtus these reserves are called up, as it is a law of nature that the fœtus must be supplied as long as there is any of the required element in the mother's body. When the mother's reserves begin to be depleted she herself will show signs of deficiency.

EFFECT OF DIET ON HUMAN REPRODUCTION

The investigation of how far perfect reproduction depends on perfect nutrition is still in its infancy and the next twenty years will probably greatly expand our knowledge. Already there is a mass of evidence, some final, some still subject to inquiry. Complications of pregnancy or child-birth believed to be due to dietary deficiency are the following:—

(1) *Anæmia*, due to a deficient intake of iron-containing foods.

(2) *Rickets and osteomalacia,* conditions characterized by softening and distortion of the mother's bones, due either to a deficient intake of calcium-containing foods or to faulty assimilation of calcium owing to a deficiency of vitamin D (which is needed for full assimilation of calcium). Rickets, which occurs in childhood, is less severe in this country than formerly, but slight manifestations are still often seen in practice leading to pelvic contraction and delayed labour. Osteomalacia is common and severe in parts of India and China, also leading to pelvic deformity and difficult labour. It is said to be present in this country in a latent condition (E. Mellanby, 1937).

(3) Other symptoms of *calcium deficiency* are spasms, insomnia, restlessness, pains in limbs, dental disease.

(4) *Polyneuritis,* due to a deficiency of vitamin B_1-containing foods. This is common in some eastern countries. Modified forms of vitamin B_1 deficiency are frequently met with in this country and show themselves as neuritis, anorexia, dyspepsia, constipation, lassitude.

Other conditions suggested as due or partly due to dietary deficiency but still under inquiry are the following:—

(5) *Tropical macrocytic anæmia,* common in some tropical and sub-tropical countries and occasionally met with in England, believed to be due to a lack in the diet of Castle's extrinsic factor, not yet identified (Wills, 1935).

(6) *Puerperal sepsis.* Green and Mellanby (1929) claim that the administration of vitamin A during the last part of pregnancy reduces the incidence of puerperal sepsis and others have proved its value as an anti-infective agent.

(7) *The toxæmias of pregnancy.* Theobald has made several communications, indicating that these are of nutritional origin (Theobald, 1935, 1937).

(8) *Sterility and abortion habit.* Many workers, both experimental and clinical, have claimed that vitamin E, as contained

in wheat-germ oil, will induce conception, or avert abortion in cases where it had been habitual (Möller, 1931).

(9) *Failure in lactation.* A poor protein diet will reduce the amount of milk (Hoobler, 1917).

REQUIREMENTS OF THE MOTHER DURING PREGNANCY AND LACTATION

Calories.—The Ministry of Health Advisory Committee on Nutrition (1937) recommend 2,400 calories as the basic requirements for an adult male or female not engaged in manual work and includes in this recommendation pregnant women. If such a woman engages in work, supplements are needed. House-work is considered light work and 75 calories should be added for every hour worked. A woman engaged in house-work for four hours daily would require 2,700 calories daily. During lactation the mother is providing for the full needs of her infant and the object to secure is that she should do so without herself losing weight—that is, that the diet should be adequate for herself and her child. An infant from birth to six months of age requires 100 calories and after six months 90 calories per kilogramme of body weight daily. If the baby's weight at birth is taken as 3½ kilogrammes (7¾ lb.) the mother would require an additional 350 calories at the beginning of lactation, gradually increasing to about 700 after the sixth month, according to the weight of the child.

Some obstetricians recommend that calories should be restricted during pregnancy to avoid excessive growth of the fœtus and difficult labour. But evidence goes to show that differences in maternal diet do not ordinarily affect the birth weight of the fœtus (Brend, 1918), although severe malnutrition, continued for some time, as during war, may depress the weight at birth. Some believe that calories and also protein intake should be restricted to diminish the danger of toxæmia,

a condition frequently associated with rise in maternal weight. This rise, however, is usually due to accumulation of fluid in the tissues and is not the result of overeating. Some evidence, as already stated, has been brought forward to the effect that toxæmia follows on a diet deficient in minerals and vitamins, but general medical opinion still holds that protein should be restricted as far as possible in cases of threatened toxæmia. It is found with young animals that extra feeding during the last period of pregnancy, whereas it does not increase the size of the young, has a marked effect in increasing the flow of milk.

Protein.—The daily intake for adults should be not less than 1 gramme per kilogramme of body weight. During pregnancy the fœtus, uterus, and placenta are increasing in size, and after the third month half as much protein as before should be given. Thus a woman weighing 8 stone would receive 50 grammes and, as pregnancy advanced, 75 grammes daily. A good part of this protein should be of animal origin. During lactation in order that the mother's nitrogen should have a positive balance, an intake of 2 grammes of nitrogen for each gramme in the milk is necessary. If she produces a litre of milk (1·7 pints) with a protein content of 2 per cent., she will require an intake of about 100 grammes a day, that is, a larger amount than is necessary during pregnancy. There is some evidence that the greater the retention of nitrogen during pregnancy the more likely is lactation to be adequate. In cows the milk varies in amount with the protein intake. The protein concentration is not affected by reduced intake, but the amount of milk secreted is limited (Macomber, 1934).

Carbohydrate.—Except as a source of energy, carbohydrate plays a small part. There is a danger that excess of carbohydrate will lead to a diminished intake of protein and vitamins.

Fat.—This is valuable as carrying some of the more impor-

tant vitamins; indeed, it may be essential to the proper utilization of the vitamin, a fact important to remember in connexion with the giving of vitamin supplements.

Water.—This should be abundant, from 3 to 4 pints daily.

Mineral salts.—A sufficiency of iron, calcium, phosphorus, and iodine is important in the interests of both mother and child. A minimum of 1·7 grammes of calcium is required daily during pregnancy and lactation, and modern diets usually fall far short of this. During pregnancy the mother may supply iron or calcium from her own reserves, falling a victim to some of the deficiency diseases already mentioned. As regards the infant, experimental evidence shows that, although healthy young may be born from mothers with marked calcium or iron deficiency, there is a tendency for the deficiency to appear in the young in subsequent litters or generations, the conditions being the same as regards diet. Maxwell in China (1925) found that human infants born of osteomalacic mothers, especially after the second pregnancy, were osteoporotic and later developed rickets, and M. Mellanby (1928-29) found that gross hypoplasia of teeth and subsequent increased liability to caries may be the result of a defective maternal diet.

As regards lactation, an adequate supply of calcium and phosphorus is most essential. Calcium must be provided in considerable excess of that needed in the milk owing to the waste in excretion from the intestine. The supply of vitamin D must be sufficient to ensure proper assimilation of the dietary calcium. As in pregnancy 1·7 grammes per day of calcium is required. It is best obtained in milk of which two pints should be taken daily both by the pregnant and nursing mother. It is also contained in cheese and green vegetables. Iron is required in rather smaller quantity than during pregnancy, from 12½ to 15½ mgm., and is obtained from such foods as eggs, cheese,

liver, meat, green vegetables, potatoes. If such diets cannot be taken the mother must be given iron and calcium salts. Dairy evidence confirms the importance of a sufficiency of mineral salts during lactation, farmers finding that cows and pigs on a calcium-deficient diet yield less milk, especially in later lactations. In the first lactation the deficiency may be made up at the expense of the mother's bones.

In connexion with dietary calcium it has been suggested that rich supplies taken together with vitamin D to ensure full assimilation, may cause earlier ossification of the child's head, so causing difficulty in delivery. This is a matter in which clinical evidence would be valuable.

Iodine is of importance to prevent abnormality of the thyroid gland, predisposing to goitre and even to cretinism. Sea fish is a good source and should be taken at least twice a week. Failing this, table salt prepared with iodine may be used.

Vitamins.—All the vitamins are of importance in pregnancy and lactation. Vitamin A, known as the anti-infective vitamin, is believed by some, as already noted, to protect against puerperal fever, if given in rich quantity during the latter part of pregnancy. There is evidence from farm stock that maternal deficiency of vitamin A has a bad effect on the young. Hart (1933) reported that during a dry season in California green stuff was scarce and calves were still-born or weak, frequently dying of respiratory disease. Their livers were devoid of vitamin A. The giving of green stuff and cod-liver oil to the cows prevented this condition. Other workers have produced evidence to show that it is not always possible to increase the vitamin A content of fœtal livers merely by dosing the mothers with vitamin A, but the addition of fat may bring about success. The same has been found with lactation, but feeding the mother with cod-liver oil increases the vitamin A content of the milk. The human infant needs 2,000 international units

daily. The vitamin is contained in milk, eggs, cheese, liver, green vegetables, and cod-liver oil. The mother should receive a minimum of 5,000 international units daily.

Vitamin B complex is important. Vitamin B_1 is a neuromuscular stimulant, improving digestion and assimilation and increasing the force of uterine contraction. Vitamin B_2 has a special action in preserving the integrity of the epithelium of the skin and mucous membranes, and so hinders the entry of germs and may protect against puerperal sepsis. Much experimental work has been done to show that animals deprived of or partly deprived of vitamin B are liable to abort, the young being sometimes resorbed, or if the young are born alive they tend to die. Moore and Brodie (1927) estimate that rats require four times the amount of vitamin B_1 complex to ensure the conclusion of a successful pregnancy than they do at other times. It is also found experimentally that this vitamin has an important influence on lactation, as it improves the mother's appetite and produces an abundant flow of milk. When it is deficient, young rats tend to die with defective blood-formation and hæmorrhages. These conditions can be prevented by giving the mother a larger supply of the vitamin in her diet, but it has been found better to give it direct to the young. Vitamin B complex is usually deficient in the dietary of this country and many of the symptoms so common in pregnancy, such as dyspepsia, loss of appetite, lassitude, and uterine inertia are perhaps due to this cause. It is believed by many that vitamin B_1 deficiency among nursing mothers is the cause of much of the gastro-intestinal trouble so common during the first year of life. Both during pregnancy and lactation the mother should have a minimum of 300 international units of vitamin B_1 and a rich supply of vitamin B_2. Vitamin B_1 is contained in yolk of egg, liver, kidney, heart, green vegetables, and tomatoes, but its richest natural source is brewers' yeast. It

is also abundant in whole cereal grains, especially wheat germ. Vitamin B_2 is contained in yeast, liver, kidney, meat, eggs, milk, and green vegetables. Whole cereal grains do not contain much B_2, although they are rich in B_1. On the other hand, milk and meat which contain good supplies of B_2 are poor in B_1.

The uses of vitamin C in pregnancy are not yet fully understood but, as the excretion of ascorbic acid in the urine is increased, there is evidently an increased demand. Toverud (1936) suggests that a condition of latent scurvy in the fœtus, leading to cerebral and other hæmorrhages and fœtal death, may be due to a maternal deficiency of this vitamin. It should be noted that human milk contains more vitamin C than cows' milk. An infant is estimated to require 100 international units of vitamin C daily, which would be met by 1 litre of human milk or the equivalent of $2\frac{1}{2}$ litres of cows' milk of best quality. An artificially fed infant would require supplements of fruit juice to supply the additional vitamin C. The mother during pregnancy should have over 500 international units per day. This vitamin is contained mainly in milk and green vegetables, orange and lemon juice, and various kinds of fresh fruits.

Vitamin D is of prime importance in pregnancy because of its function in promoting the absorption of calcium from the mother's intestine and maintaining it at its normal level in the maternal blood. It regulates calcium and phosphorus metabolism and fixes calcium in the bones and teeth, in which it is associated with the parathyroid gland. A deficiency of vitamin D leads to non-absorption of calcium from the intestine, shortage of calcium in the blood, imperfect deposition of lime and phosphorus in the bones, and the occurrence of rickets. In the young the structure of the teeth is impaired and dental decay follows. All these conditions are accentuated in pregnancy owing to the demand of the fœtus for calcium and may

result in osteomalacia or the slighter degrees of calcium deficiency already mentioned. A good maternal supply of vitamin D is of the first importance to the fœtus, especially in connexion with the deposition of calcium in the bones and the teeth, and later to ensure a milk rich in calcium. The mother should have 300 international units daily. Vitamin D is, unfortunately, not abundant in most food-stuffs, but it is present to a rich extent in cod-liver oil, which may be given daily. It is also obtained by the action of sunlight on the skin.

Vitamin E is concerned with the efficiency of the reproductive system. It has been successfully used in the treatment of sterility and chronic abortion and is believed to be of importance in connexion with the maintenance of breast milk. It occurs to a rich extent in wheat germ and is present in eggs, milk, meat, and green vegetables.

DETAILS OF DIET

The facts given above show that the diet taken by the expectant mother is of supreme importance both for her own sake and for the sake of her child. Deficiencies in her diet may have far-reaching consequences. A suitable diet in pregnancy not only tends to a safe and easy delivery but to a healthy child and to a successful lactation. The diet can be provided from ordinary food-stuffs, indeed that is most desirable, but it must contain more protein, calcium, iron, iodine, and all vitamins, than are taken in the non-pregnant state. These will be obtained in sufficient quantity if the daily intake includes two pints of milk, wholemeal bread, fresh fruit, green vegetables in good quantity daily, and sea fish twice weekly. But, as it is not always possible to secure the taking of such a diet, supplements may be needed, in the shape of calcium salts, iron salts, cod-liver oil, orange juice, yeast, bemax, or marmite. Rich puddings, cakes,

or pastries should be avoided not only in order to prevent digestive troubles but because the carbohydrate intake will be unduly increased and the protein intake diminished.

The following simple dietary provides the optimum needed from common food-stuffs:—

BREAKFAST.	Milk flavoured with tea or coffee. Cereal with milk. Toast (wholemeal bread), butter, marmalade or jam. Fresh fruit.
LUNCH.	Soup. Meat or chicken, 2 oz. Cabbage, 4 oz., also potatoes. Rice pudding made with milk and egg, stewed prunes.
TEA.	Bread and butter, slice of cake.
DINNER.	Fish, 2 oz. Fresh salad. Cheese and biscuits. Fresh fruit.
SUPPER.	Milk, ½ pint.

These or similar foods must be prepared in different forms to secure variety. The best plan is to explain to the mother the reasons for the diet and tell her that the milk must total 2 pints, bread should be about ½ lb., and she should take fruit, green vegetables, and tomatoes as much as she conveniently can. It must be remembered that the amount of milk, being larger probably than formerly, is introducing larger quantities of animal protein and fat, hence other protein- and fat-containing foods must be limited to the amounts shown above. Unless the mother has opportunities for abundant sunshine, she should be given 1 teaspoonful of cod-liver oil daily to provide vitamin D. It is important to ascertain how closely she is following the dietary, as some women find it difficult or impossible to take large quantities of milk and green vegetables and it is better to give these artificial supplements rather than leave them with a deficiency. If such women are unable to take more than a pint of milk, the protein can be made up by

giving an additional egg, more cheese, and some lentils or beans. More vitamin A will thus be provided which will be sufficient if green vegetables are being taken plentifully, otherwise an additional teaspoonful of cod-liver oil should be given. Calcium lactate, 20 grains three times a day, will also be required. If both milk and green vegetables are being restricted, iron salts will also be needed. Some women will not be willing to take fresh fruit but will take fresh fruit juice once or twice daily to get vitamin C.

An interesting commentary on the value of supplements to poor diets is found in the work of the National Birthday Trust Fund in the special areas in South Wales and County Durham. Supplements of milky foods, together with marmite or wheat extract, are being given to expectant mothers and records are being kept of the maternal and neo-natal mortality, (Balfour, 1938). The supplements given do not raise the protein and mineral intake to what is required, but the vitamin intake and especially the vitamin B intake is increased. The results of this scheme, not yet concluded, should add information of great value to that already collected on the effect of diet on pregnancy.

In cases in which toxæmia appears to be threatening it is usual to give a low protein diet, in fact to exclude protein other than that contained in milk, and in severe cases to exclude milk itself. Toxæmia, however, includes many conditions: if a deficiency disease, the question arises if the deficiency is due to diet or to a pathological lack of assimilation of some essential factor. The question is a big one and it is well to avoid dogmatic statements and watch the development of further research.

CONCLUSION

It cannot be too strongly emphasized that we have a long way to go before we can speak with certainty on the full effect of

diet on pregnancy, especially on abnormal pregnancy. There is, however, abundant evidence to prove that diet is a most important and essential factor in the preservation of the mother's life and health and the production of a really healthy child. Every effort that can be made in hospitals, laboratories, clinics, and general practice is needed to advance knowledge and to test the new facts and theories from time to time published in medical literature.

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CHAPTER XVIII

DIET IN THE TROPICS AND TROPICAL DISEASES

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NAPOLEON is credited with the statement that "an army marches on its stomach." If this be true of the massed battalions it must be true of each soldier in the ranks. Even more may the aphorism apply to the white man in the tropics. His health and efficiency depend on how he adjusts himself to his environment—a new one in many cases—and one of the most important factors in his new situation is food.

EFFECT OF CLIMATE

In considering diet in the tropics some consideration must be given to the effect of climate on the body. Man, no matter where he lives, has two essential needs, (1) energy for the maintenance of the vital processes, (2) supplies to repair or replace worn-out body tissues. Food and oxygen are the sources of these essential wants, the energy being derived from the oxidation of the food; the repairing substances from the assimilated products of digestion. In the report of the Committee on Nutrition issued November 1933 it is stated that the daily requirements of an adult male in proteins, fat and carbohydrates are as follows:—

Protein, first class	50 grammes
„ second class	50 „
Fat	100 „
Carbohydrates	500 „

Some variation of these figures may occur in the case of people resident in the tropics for the following reasons. The constituents of the food which provide energy are the proteins, carbohydrates, and fats. Proteins and carbohydrates are taken as liberating 4·1 calories and the fats 9·3 calories of heat per gramme on oxidation; but there is this difference that in the human body after consumption of a standard amount of each substance, while the carbohydrates and fats produce about the amount of heat to be expected from their calorie value, the proteins give rise to considerably more heat. The explanation given is that the end products of protein digestion, the amino-acids, have a stimulating power on the tissues of the body, which results in increased heat production. Put shortly, a body engenders and loses more energy in the form of heat while working on proteins than on carbohydrates or fats. The importance of this fact then in the regulation of the diet with regard to the relative amounts of protein, carbohydrates, and fats ingested by the individual in the tropics becomes at once apparent.

It is well known that peoples living in cold climates have come to adopt diets rich in fats and proteins to supply heat and energy, whereas those races living in the tropics rely on diets with greater carbohydrate content. Experience has proved these as the most suitable diets, and the explanation lies in the heat-producing values of their constituent items.

Climate has an effect on the race as shown by the results of residence in the tropics on the white races. Alterations in type which are recognized as occurring in the succeeding generations born in the tropics may be due to many factors. Heat must be included in these, affecting as it does metabolism, the amount of work and exercise and, in consequence, appetite, it becomes a vital force in tropical life. Broadly speaking there are two types of hot climate, the dry and the damp. A dry

warm atmosphere leads to excessive loss of water and salt from the body through the channel of the sweat. This excessive loss brings about dehydration of the tissue cells with consequent impairment of their tone and function. Balfour Kirk (1931) pointed out that the loss of tone of the cells leads to a general dilatation of the capillary blood-vessels over the body in addition to the expansion of the peripheral capillaries, due to the contact with the warm air and the effect of the solar rays. Such capillary dilatation leads to a slowing of the circulation of the blood and lowered blood-pressure, thus further affecting adversely the processes of digestion. The excessive loss of fluid, due to the mechanism of the sweat being called to do extra work with the object of keeping the body temperature within normal limits, leads to increased loss of salts, resulting in various derangements such as muscular cramps and tetany. In hot damp climates evaporation and cooling by the sweat mechanism is impeded, and the body temperature is not so easily reduced by this natural method. Here other means of combating the heat have to be invoked, such as punkas, "tatties" or electric fans, causing air currents; and more recently the adoption of air-conditioned houses and offices, and the regulation of working and exercise times so as to avoid movement during the warmest hours of the day.

Exercise as an inducer of appetite loses importance because under damp conditions especially, increased body work means increased heat-production; appetite too is reduced because assimilation of food causes again increased heat-production. In such circumstances both bodily and mental vigour become impaired. In the future tropical heat will be combated by the construction of cool air-conditioned houses and offices. This plan has already been adopted with success in certain places, and the deleterious effects which were anticipated have not been seen.

GENERAL REQUIREMENTS

First and foremost then, the ideal tropical diet must contain an adequate daily supply of fluids with contained salts, and this supply must be greater than that usually taken by the individual in temperate climes. Chopra points out that water is essential for the body processes, being the medium for allowing chemical action to occur and other products to be distributed to the tissues, and that an average water-content of about 70 per cent. is necessary for this purpose. Taken with meals, water aids digestion and assists the flow of the digestive juices. Lack of sufficient fluid is one of the chief causes of the widespread constipation encountered in tropical practice.

An ideal tropical diet should therefore contain

(1) Ample supply of water and fluids as already emphasized.
(2) Available proteins in moderate quantity.
(3) Fats.
(4) Moderately increased amounts of carbohydrates.
(5) Mineral constituents, such as salts and iodine.
(6) Vitamins in adequate amount.
(7) Sufficient food residue or "roughage" to promote peristalsis.

Food items to which the individual is "sensitive" should be rejected.

ENERGY VALUE IN CALORIES REQUIRED IN THE TROPICS

On this question there is considerable difference of opinion, as seen by these figures quoted.

Rosenau (1927) gave the following as adequate for a man of average weight doing moderate work :—

Protein - - -	100 grammes	400 calories
Fat - - -	100 ,,	900 ,,
Carbohydrates -	2,000 ,,	2,000 ,,
	Total - -	3,300 ,,

Analyses of diets abroad have produced the following figures.

Europeans in Malaya -	2,471 calories,	Eijkman	(1924)
Malay students - -	2,512 ,,	,,	,,
Malay servants - -	2,465 ,,	,,	,,

Diet scale in Katanga, 1917, 4,916 calories, Pearson and Mouchet.

Diet scale on the Rand, 1918, 4,303 calories, Pearson and Mouchet.

Nicholls states that the energy value of the food of the average labourer in the tropics may safely be placed at 2,600 to 2,700 calories.

Chopra gives the following as a rough estimate, easy to remember, and while liberal, sufficiently accurate for most purposes.

Man or woman quiet at home taking little exercise needs about 2,500 calories.

Engaged in sedentary occupation, 3,000 calories.

Taking moderate exercise, ordinary light work, 3,500 calories.

Doing hard work, 4,000 calories.

In calculating the caloric value of a diet it must be remembered that the values of the food constituents may alter in the tropics. It has been shown that the calorie values of food items may not be the same for equal amounts of proteins at home and abroad. The source of the protein or food constituent must be taken into account. Some sources give a greater amount of nitrogen absorbed than others. McCay's findings indicate that the absorption of food varies with (1) the type of food, (2) the bulk of the diet, (3) the method of cooking, and (4) the state of the digestive organs. Hence the value of a diet cannot always be assessed from chemical analysis of its items. He showed that on a diet of millet, dal, and vegetable containing 16 grammes of protein, only 9½ gm. is absorbed; whereas, if wheat replaces the millet, absorption rises to 13 gm. although the original N. content of the diet is the same as before, thus indicating that vegetable sources of protein are not always satisfactory. Too bulky a diet also may check protein absorption as, digestion not being completed, a large non-digested residue is left. These factors, combined with lack of variety in the food, account for the malnutrition, poor physique, and lack of resistance to disease in many native races. It must not be forgotten, too, that the amount of food necessary to

maintain health varies with the individual, even under similar conditions and when size and weight are the same.

GENERAL RULES

As custom dies hard, the European in the tropics is inclined, if he can get it, to eat the same food as at home. The diet abroad should be modified and adapted to the available food. Rogers and Megaw advise the eating of meat in small quantities; one meat dish of good quality and well cooked, twice daily, being sufficient. Fresh vegetables and fruit in plenty should be taken. Good wholemeal bread, if obtainable, is valuable in supplying vitamins and roughage. Fresh milk and butter are good. Milk ought to be brought to the boil and then cooled at once. Plenty of pure water should be taken, and the morning glass of cold water is recommended. Alcohol, if taken, should only be in moderate amounts. Cocktails and short drinks before meals are deleterious, as their alcohol irritates the gastric mucous membrane and, being quickly absorbed, damages the liver. It also renders the individual more liable to hepatic abscess, heat-stroke, and neurasthenia, and, by being habit-forming, it undermines health and shortens life in the tropics. On the other hand it is of value medicinally in certain conditions, and used in moderation it promotes good fellowship. In the tropics, where efficiency should be conserved, it is well to remember that Atwater and Benedict's laboratory observations on the efficiency of the body as a machine, 29·55 per cent. without alcohol as against 25·62 per cent. with alcohol, have been confirmed.

Diets in native races show great variations, and deficiencies and nutritional defects are frequent sequelæ. The Sikh diet is often quoted as one of the best and these natives of the Punjab show good physical development on a diet very different from that adopted by Europeans. This diet consists approximately

of milk ($\frac{3}{4}$ pint), butter or ghee 2 oz., wheat 24 oz., dal 3 oz., vegetable 6 oz., and meat 4 oz. Chesterman (1937) gives the following scheme as a guide for dieting adult natives in Africa doing steady work.

Carbohydrates from either flour of cereals or corn, or from fresh dried or prepared roots or potatoes. If as flour, 1 kgm. daily. Or substitutes, which must be given in the following proportions for weight of flour withheld:

Four times weight of plantain in skins ;
Three times weight of fresh cassava (or potatoes) ;
Twice weight of dough ;
Same weight of stale bread, biscuits, or rice.

Not more than half the ration should be given as polished rice. Proteins from a combination of animal and vegetable sources:

Animal, fresh meat or fish - - - - -	200 gm. daily
or dried meat or fish - - - - -	100 gm. ,,
or tinned meat or fish - - - - -	125 gm. ,,
and Vegetable, dried peas, beans or lentils - -	75 gm. ,,
or ground nuts - - - - - -	75 gm. ,,

If it is necessary to replace a part of the animal protein by vegetable, then for fresh meat twice, and dried meat four times, the weight of vegetable must be given.

Fats, butter or some edible oil - - -	50 gm. daily
or ground nuts or beans (in addition to those used as proteins) - - - -	75 gm. ,,
Salts, common salt (sodium chloride) - -	15 gm. ,,

Vitamins, fresh fruit and vegetables, at least 1 kgm. a week.

A function of the food becoming much emphasized in recent years is the adequate supply of mineral substances and vitamins for the regulation of body processes. The daily amount in grammes of the minerals chiefly required by an adult is roughly given by Hutchison and Mottram as follows:—

Phosphoric acid- -	3 to 4	Calcium- - -	0.4 to 1
Sulphuric acid - -	2 to 3.5	Magnesium - -	0.3 to 0.5
Potassium oxide -	2 to 3	Chlorine - -	6 to 8
Sodium oxide - -	4 to 6	Iron - - -	0.015

Some iodine, copper, silica, and fluorine in small amounts are also needed. Milk, eggs, cheese, and to a less extent meat, fish, bread, fruit and potatoes supply calcium and magnesium. Iron is present in green vegetables, dried peas, red meats, and

eggs, potatoes, rice, and wheat. Sulphur is contained in the proteins, sodium in animal, and potassium chiefly in vegetable foods. Phosphorus is found in liver, sweetbreads, kidneys, milk, cheese, egg yolk, bran, tubers, and fresh vegetables. Iodine comes from water and plants ; fluorine and silica from vegetables and cereals, and chlorine is mainly supplied by common salt.

Vitamins.—Deficiency in vitamins is common in the tropics. Besides those diseases, such as beri-beri, rickets, scurvy, pellagra and tropical macrocytic anæmia, in which a definite shortage is present, lesser degrees of vitamin deficiency cause much vague illness. Most natural foods of animal and vegetable nature supply these substances. If alkalis are not added cooking does not greatly diminish the amounts of A, B, and D vitamin in the food, but does destroy most of the vitamin C. Freezing and refrigeration do not destroy these substances, but, if kept at freezing point and exposed to oxygen, they are stated to undergo slow destruction. Some can be perserved by tinning, others not.Vitamin C, so important for infant feeding, may be reduced by half during pasteurization or scalding of milk, whereas drying or condensing causes some variable loss. Condiments, in the form of curries, are widely used in certain tropical countries. As many condiments contain vitamin C, they are valuable where vegetables are scarce. As they give flavour to the monotonous diets of many of the poorer races, they are valuable. They also stimulate appetite, but excessive use may contribute to the onset of cirrhosis of the liver and diabetes mellitus.

Cold Storage.—Meat must be chilled or frozen ; the latter method affords the better preservation. Emmett and Grindley state that for short periods, up to twenty days, there was no loss of water, after forty days the water loss was only 1.3 per cent. ; the nutritive value of the meat was unaltered. Poultry also

showed practically no change of nutritive value. Refrigeration does not render meat infected with trichina or other parasites safe as food. Roughage or the parts of the food which remain undigested are of great importance. Diets too often contain "tasty" foods lacking in residue. The need of bulk in the motion sufficient to stimulate peristalsis is only too necessary when many factors contribute to the constipation too common in tropical practice.

DIET IN DISEASE

AMŒBIC DYSENTERY.—In this disease the body has been invaded by the *Entamœba histolytica* which, settling down in the large intestine, causes ulceration of the gut-wall. The diet therefore has to be adapted to a non-febrile patient whose bowel may show ulcers ranging in size from a mere spot to an area of more than an inch in diameter, in which sloughing may occur and in which gangrene or perforation of an ulcer leading to peritonitis has sometimes taken place. The food therefore must be free from roughage and from any residue which will irritate the bowel, lodge in the ulcers, or lead to shedding of the sloughs. Treatment with some form of emetine is usually adopted as the drug is definitely specific for the disease. The combined treatment with emetine-bismuth iodide given by the mouth and yatren 2 per cent. solution as a retention enema is credited by many as giving the best results. Emetine taken orally causes nausea and vomiting so that should this method of treatment be adopted the last meal is given at 6 p.m. and the drug administered at 10 p.m. For the ten days that this method of treatment usually lasts, Manson-Bahr recommends the following diet scheme :—

7 a.m.	Pot of tea and 2 oz. milk.
7.30 a.m.	One egg, buttered toast, cup of tea and 2 oz. milk.
9 a.m.	8 oz. milk.
10.30 a.m.	Juice of an orange, glucose ½ oz.

12 noon	Liver soup, chicken or fish (boiled or fried), white sauce, toast, butter, custard, or milk jelly, baked apple.
4 p.m.	Boiled egg, toast, butter, juice one orange and $\frac{1}{2}$ oz. glucose or grape-juice or ripe banana, sponge fingers.
6 p.m.	Milk 8 oz.

One pint of a 2 per cent. sodium bicarbonate solution to wash out the bowel is given at 8 a.m. and this is followed by the 8 oz. yatren retention enema at 8.30 a.m.

For the four weeks, after treatment by the above method, the following convalescent diet is observed.

Permitted.—Fine porridge; eggs; filleted or fried fish—haddock, plaice, cod, sole, whiting; toast or rusks; milk puddings—rice, sago, ground rice, semolina; plain cakes, fruit jellies; stewed pears or peaches; baked apples; bananas, grapes, pawpaw.

Tripe, brains, sweetbreads.
Chicken, boiled in rice.
Spinach, young peas, vegetable marrow, and pumpkin.

Not permitted.—Cheese; new bread; potatoes; fats; suet puddings; rich cakes with raisins or spices; pastry of all kinds; pickles.

Beverages.—Light wine only, no spirits, beer or stout.

Meat.—Beef or mutton can be given once daily.

Rich, too starchy or too highly nitrogenous foods tend to cause relapse as does alcohol unless taken in the smallest quantities.

BACILLARY DYSENTERY.—Here the condition present is a generalized inflammation of the large bowel often extending into the small bowel. Toxæmia and pyrexia are present. Various degrees of severity of the disease are seen : in severe cases gangrene of the mucous membrane of the entire colon may supervene. Diet must be fluid in the acute stage and as nutritious as possible as the patient becomes exhausted. Milk is not well tolerated in any guise and forms clots of casein to be passed in the stool. Fluids in plenty are given at first, water, albumen water, rice-water, or weak tea. Later nourishment is regularly administered, barley-water, orange juice, glucose water, beef-tea, chicken-tea, broths, Brand's essence, arrowroot, cornflour and sago puddings, at two-hourly intervals in small quantities, 6 to 10 oz., only slightly warmed, at each feed.

The diet is cautiously increased ; too rapid increase will cause relapse and rise of temperature. If this occurs no further increase is attempted. Articles are selected which leave little residue ; eggs, jellies, fish, and chicken.

The following diets are used for hospital patients in Malaya by Hawes.

Acute Dysentery.

6.30 a.m.	Riceflour 4 oz.	Barley water 10 oz.
10 a.m.	Cornflour 4 oz.	
12.30 p.m.	Riceflour 4 oz.	
3 p.m.	Riceflour 4 oz.	
6 p.m.	Cornflour 4 oz.	Barley water 10 oz.

Chronic Dysentery. High Protein Diet.

Time.	*Diet.*	*Constituent.*	*Weight.*	*Calories*
6 a.m.	Tea - - - -	Tea - - -	1 teaspoon	—
	Sugar - - -	Sugar - - -	½ oz.	56
	Cracker toast (2 slices)	Bread - - -	1 oz.	70
	Margarine - - -	Margarine - -	½ oz.	108
9.30 a.m.	Soup, clear strained -	Neck of mutton -	2¼ oz.	111
	Rice Kanji, added -	Rice, parboiled -	1 oz.	103
	Egg poached - -	Hen's egg - -	1 (1½ oz.)	75
	Cracker toast (1 slice)	Bread - - -	½ oz.	35
	Seasoning (curry stuff)	Seasoning - -	⅛ oz.	10
2.30 p.m.	Fish, fresh - - -	Fish, fresh (fatty) -	4 oz.	440
	Vegetables - - -	Vegetables - -	2 oz.	12
6.30 p.m.	Tea - - - -	Tea - - -	1 teaspoon	—
	Sugar - - -	Sugar - - -	½ oz.	56
	Fish - - - -	Fish, fresh - -	4 oz.	440
	Cracker toast (2 slices)	Bread - - -	1 oz.	70
	Margarine - - -	Margarine - -	½ oz.	108
				1,694
	Vegetables may be -	Spinach - -	2 oz.	12
		Egg plant (Bringal)	2 oz.	22
		Pumpkin (labu merah) - -	2 oz.	47

THE MALARIAS (*benign tertian, quartan, and ovale types.*)—During the hot stage of the attack plenty of fluids can be given such as soda water, lemonade, orangeade, barley water or weak tea. Fluids can be given cold (not iced unless the purity of the ice can be guaranteed). The soda water can be made by adding a teaspoonful of sodium bicarbonate to the pint of

drinking water. This can be left at the bedside and the patient encouraged to drink. Taken in quantity it assists in maintaining the alkalinity of the urine and helps to check vomiting. Alkalis are important in conjunction with quinine in treatment. There is evidence to show that relapse is less frequent after the combined quinine-alkali treatment than when quinine has been used alone. As the fever resolves, items such as milk, beef-tea, raisin-tea, chicken or mutton broth can be added. Milk soups, meat extracts, coffee, cocoa with milk, chocolate, ice cream, junket, and jellies will provide variety. During the remission periods light, easily digested solids are allowed, and during convalescence, if the appetite is good, full diet may be permitted. When treatment with quinine is continued for some time the diet should be planned with a view to maintaining the body alkalinity. The following foods produce alkali : asparagus, beans dried, beets, cabbage, carrots, cauliflower, celery, cucumbers, lettuce, onions, peas, potatoes, radishes, tomatoes, turnips, almonds, apples, bananas, cocoa-nut, dried currants, grape-fruit, lemons, oranges, peaches, pears, and milk. A peculiarity of quartan malaria is that it may be followed by a subacute or chronic nephritis. Such a complication would demand a convalescent diet suitable to a nephritic patient.

Subtertian type.—In this form the feeding of the patient during an acute attack is often difficult owing to the persistent vomiting. The early absorption of plenty of alkaline fluid may reduce the amount of nausea and vomiting ; but frequently, particularly in the bilious remittent variety, nothing will remain in the stomach. Sterile 5 per cent. glucose solution should be given intravenously and is often magical in its action in checking the sickness. Patients with the algid form will require hot not cold fluids, i.e. hot tea or coffee ; the choleraic and dysenteric form also demands copious warm

drinks ; while the hæmaturic form, like the quartan nephritic form, will be met with barley water, fruit juices, and milk. Convalescent diets will be modified according to the form that the attack assumed.

BLACKWATER FEVER.—Here, even more than in the subtertian malarial infection, the early alkalinization of the patient is of vital importance, not only in the hope of reducing the nausea and vomiting, but in quickly bringing about the alkalinity of the urine and so retarding the clogging of the renal tubules with debris and acid hæmatin, and thus delaying the possible onset of anuria with its fatal results.

One patient in my experience immediately he saw that he was passing "black water" proceeded steadily to consume the content of the bedroom jug filled with drinking water to which sodium bicarbonate had been added. His reward was the clearing of the urine on the evening of the second day.

These patients must be coaxed to take plenty of soda water, barley water, glucose water, fruit juice, followed later by fruit jellies, junket, milk, custard, and Benger's food. Proteins are restricted until the patient is convalescing owing to the renal involvement, and, as the diet is gradually extended, liver and iron-containing foods are added to aid in repairing the inevitable anæmia.

KALA-AZAR.—This disease, frequently diagnosed in error as malaria, is interesting on account of the fact that though the patient may be weak and wasted, with an enlarged spleen, and running a temperature well above 100° F., he may have quite a good appetite, a clean tongue and be unaware of his pyrexia. If dysenteric symptoms are absent and there is little diarrhœa and flatulence, a more liberal diet may be given than such a temperature would usually permit, meat, vegetables, and fruit may be allowed. During treatment, if antimony is being given intravenously, an interval of one or two hours should be observed between the meal and the injection times.

TRYPANOSOMIASIS.—In pyrexial intervals fluid diet may be needed. Ordinarily a varied, readily digestible diet can be given, aimed at building up the patient's general health, Should Bayer 205 (a complex organic urea compound) be the drug selected for treatment a watch will need to be kept on the renal functions as this drug may cause nephritis. Albumin and casts are commonly seen in the urine after the first few doses. The diet then should be along lines suitable to a nephritic patient. Milk, cream, butter, bread, cereals, sago, cornflour, sugar, vegetables, eggs, fish, and chicken can be given. Usually on the cessation of the drug treatment the albumin and casts disappear in three or four weeks.

LEPROSY.—At one time it was thought that diet, particularly a continuous diet of fish, was a cause of leprosy. Time has shown that such a diet is not the cause of the disease, but that when the fish is dried, not properly preserved or partly decomposed, it predisposes to the disease. The importance of vitamins is now known. Muir points out that in tropical countries rice and other cereals, pulses, and other forms of vegetable food that are preserved dry are liable, owing to imperfect preparation and storage, to decomposition or contamination by the growth of fungi. Poisons thus formed may cause disease, or by their presence even in small quantities, lead to a loss of strength and resistance which may be sufficient in those already infected with leprosy to permit the development of that disease. He is therefore emphatic that for the leper the food must be fresh. Tinned, salted and preserved foods should be avoided. Overcooked, recooked, highly spiced and stale foods are all harmful.

Meat and fish should only be taken in small quantities and should be fresh. Fresh vegetables should be eaten freely, raw vegetables such as lettuce and tomatoes are specially good. Vegetables should not be overcooked. Plenty of fruit should be given. Fresh milk, butter and eggs (raw or slightly cooked) are good. Various peas, lentils and beans are useful.

Too highly milled rice and grain, having their valuable qualities removed, should be avoided. Tea and coffee are permitted in moderation. Alcohol should be absolutely forbidden.

Cod-liver oil, combined with ultra-violet ray treatment, will benefit some patients when taken daily. In others when there is a deficiency in the hydrochloric acid of the gastric juice dilute hydrochloric acid should be given with meals.

No food of which the digestion is difficult should be given. Meals should not be hurried, plenty of time should be taken to masticate each morsel. Excessive eating harms the patient who should still feel hungry after each meal. A short rest before and after each meal is advantageous. Muir also states " that certain toxins, absorbed from the gastro-intestinal tract, whether due to eating poisonous or partly decomposing food, or to decomposition and poison formation taking place in the bowel itself, are responsible for bringing on the reactionary phase in leprosy when the poison absorption is only occasional, and for sensitizing the patient when the absorption is perpetual so that frequent reactions occur upon slight provocation, reactions which are decidedly harmful to the patient." In the report of the International Congress of Leprosy held at Cairo in March, 1938, it was again pointed out that for the improvement and maintenance of the general health of the leper "it is of very real importance that the diet should be liberal, well-balanced, and rich in vitamins."

ANCYLOSTOMIASIS.—Severe infestation with the hookworm causes a weakening of the digestive powers. A too full or rich diet should wait until the digestive powers have been restored, or diarrhœa or even enteritis may supervene. Owing to the anæmia caused by the worm a diet rich in iron should be instituted. Foods such as lean meat, liver, egg yolk, spinach, whole-grain cereals, lettuce, carrot, raisins and grapes should be included. Alcohol should not be given immediately after treatment in which thymol or carbon tetrachloride have been

used, to avoid dangerous toxic absorption of these drugs. There is some evidence to suggest that diet affects the development of the hookworm larvæ from the stools. Loos (1911) reported that in a strictly vegetarian diet the development of the larvæ was markedly poorer than when milk or cheese was added to the food.

SCHISTOSOMIASIS OR BILHARZIASIS OF THE VISCERAL TYPE.—In this condition, which is usually limited to the colon and lower part of the small intestine, thickening of the mucous membrane occurs which may proceed to the formation of papillomas or polypi. A diet of too great residue given to these patients may cause increased peristalsis with trauma of the papillomas leading to ulcer formation or even perforation. A food regime such as is advised for patients with amœbic dysentery can be instituted with these patients when the bilharziasis is not too far advanced. When antimony is being used in treatment an interval of one or two hours should be allowed to elapse between the meal and the injection of the drug intravenously.

SPRUE.—The essential cause of this disease is unknown. Involving part or the whole of the gastro-intestinal tract in a chronic inflammation, this in the small intestine leads to the characteristic congestion and atrophy of the villi and tube glands with resulting failure of absorption of fats, glucose, and calcium. Biochemical tests fail to show functional inefficiency of the liver or pancreas. Drugs are of little assistance, rest and diet of primary importance. The popular belief that the disease can be cured by a diet of strawberries is not borne out in practice. Anæmia generally of the megalocytic type, is seen in degrees ranging from the slightest to the severity of that of pernicious anæmia and, as in the latter disease, liver therapy now holds an important place in bringing about recovery. Opinions on diet vary. For years the milk diet of Manson, the

fruit diet of van den Bergh and the red meat diet of Cantlie were the best known and the most frequently adopted.

THE MILK DIET.

1st week.—7 oz. milk is given every two hours except at 12 midnight and 4 a.m. for first three days. 8 oz. milk at same times for next four days.

2nd week.—Increase each feed gradually to 10 oz.

3rd week.—Eight feeds of 11 oz. and one feed of 12 oz. 12 a.m., 2 a.m., and 4 a.m. feeds omitted.

4th week.—Increase feeds gradually to 13 oz.

5th week.—Increase feeds gradually to 14 oz.

6th week.—Five feeds of 16 oz. and four feeds of 15 oz.

The milk should not be drunk but taken from a teaspoon. The patient is kept strictly in bed. Strawberries, beginning with small quantities, can be given with this diet. After the sixth week the amount of milk is gradually reduced and replaced by rusks, eggs, fruit, milk puddings, fish cream, chicken, vegetables, and minced mutton all cautiously added. The appearance of a relapse, indicated by increased dyspeptic symptoms or loosening of the stools, is counteracted by immediate curtailment of diet and administration of 60 minims of castor oil to clear the bowel.

This diet is often difficult to carry out in the tropics. Dried milk or milk foods have often to be used. At the suggestion of Fairley a high protein milk powder is now obtainable known as sprulac (Cow and Gate). It contains protein, fat and carbohydrate in the ratio of 1.0; 0.3 : 1.3, and the calorie value is 125 per ounce.

HIGH PROTEIN DIETARY.

For patients with marked anæmia, flatulence and meteorism the following scheme of diet, as advocated by N. H. Fairley, gives good results.

High Protein Diet, No. 1. (Calorie value 770.)

8 a.m.	Underdone beef, 3 oz.; rusks, $\frac{3}{4}$ oz.; juice of $\frac{1}{2}$ orange; and glucose, 2 teaspoonfuls.
12 noon	Soup, 4 oz.+liver extract (=$\frac{5}{8}$ lb.); underdone beef, 3 oz.; rusk, $\frac{3}{4}$ oz.; juice $\frac{1}{2}$ orange; and glucose, 1 teaspoonful.
6 p.m.	Same as 12 noon.
	Protein : fat : carbohydrate. 1.0 : 0.3 : 1.2.
	Note.—When patients are very ill two-hourly feeds of meat and beef juice can be substituted.

High Protein Diet No. 2. (Calorie value 1,280.) P : F : C.—1.0 : 0.3 : 1.0.

8 a.m.	Underdone beef, 5 oz.; rusks, 1 oz.; juice 1 orange+glucose 2 teaspoonfuls; calves-foot jelly, 2 oz.
12 noon	Soup, 4 oz.+liver extract (=$\frac{5}{8}$ lb.), and as at 8 a.m. without the calves-foot jelly.
4 p.m.	Tea, 10 oz.; milk, 2 oz.
7 p.m.	As 12 noon—calves-foot jelly, 2 oz.

High Protein Diet No. 3. (Calorie value 1,820.) P : F : C.—1.0 : 0.32 : 1.3.

6 a.m.	Tea, 10 oz.; milk, 2 oz.
8 a.m.	Underdone beef, 6 oz.; calves-foot jelly, 2 oz.; rusks, $1\frac{1}{2}$ oz.; juice of 1 orange+glucose, 2 teaspoonfuls.
10 a.m.	1 baked apple; custard, 1 oz.
12 noon	As at 8 a.m.—Soup, 4 oz.+liver extract (= $\frac{5}{8}$ lb.).
4 p.m.	Tea, 10 oz.; milk, 2 oz.; baked apple, 1 oz.; custard, 1 oz.
7 p.m.	Same as 12 noon.

High Protein Diet No. 4. (Calorie value, 2,200.) P : F : C.—1.0 : 0.34 : 1.3.

6 a.m.	Tea, 10 oz.; milk, 2 oz.
8 a.m.	Underdone beef, 7 oz.; calves-foot jelly, 2 oz.; rusks, $1\frac{1}{2}$ oz.; juice of 1 orange+glucose, 2 teaspoonfuls.
10 a.m.	1 baked apple; custard, 2 oz.
12 noon	Same as 8 a.m. but rusks, 3 oz.; soup, 5 oz.+liver extract (=$\frac{5}{8}$ lb.).
4 p.m.	Tea, 10 oz.; milk, 2 oz.; 1 baked apple; custard, 3 oz.
7 p.m.	Same as 12 noon, but only $1\frac{1}{2}$ oz. rusks given.

High Protein Diet No. 5. (Calorie value 3,020.) P : F : C.—1.0 : 0.36 : 2.0.

6 a.m.	Tea, 10 oz.; milk, 2 oz.; glucose*, 2 teaspoonfuls; rusks, $1\frac{1}{2}$ oz.; butter, 1 teaspoonful; 1 scraped ripe apple, or 1 fully ripe Canary banana (yellow ends).
8 a.m.	Underdone beef, 7 oz.; rusks, 3 oz.; calves-foot jelly, 2 oz.; juice of 1 orange+glucose, $\frac{1}{2}$ oz.; honey, 2 teaspoonfuls; butter, 1 teaspoonful.
10 a.m.	1 baked apple; custard, 3 oz.
12 noon	Soup, 5 oz.+liver extract (=$\frac{5}{8}$ lb.); underdone beef, 7 oz.; calves-foot jelly, 2 oz.; rusks, $1\frac{1}{2}$ oz.; juice 1 orange+glucose, $\frac{1}{2}$ oz.
4 p.m.	Tea, 10 oz.; milk, 2 oz.; glucose, 2 teaspoonfuls; rusks, 3 oz.; baked apple, 1 oz.; custard, 3 oz. (egg boiled or poached sometimes substituted); honey, 2 teaspoonfuls.
7 p.m.	Same as 12 noon.

* Ordinarily 2 oz. of glucose are given daily. Insulin up to 6 units twice daily can be injected with this diet, and the glucose can be increased as needed.

The times at which the feeds are changed depend on the general condition of the patient, the disappearance of intestinal flatulence and abdominal distension and the character of the stools. On an average the No. 5 diet should be attained in about three weeks. Ripe papaya may be used as a substitute or in addition to the orange juice in all the diets. When convalescence is reached the diet is extended. Vegetables such as cauliflower, marrow, celery, spinach, and young peas, being added and also fruit in quantity. Red meats, chicken, fish and eggs are taken. In the presence of carbohydrate intolerance boiled potatoes and milk puddings are introduced with caution.

The liver soup is made as follows:—$\frac{3}{4}$ lb. of chopped calves' liver is put in 25 oz. of water and allowed to simmer gently for two hours. It is then strained and one teaspoonful of marmite added with, if desired, a small amount of salt.

The following diet has been used for hospital patients by Hawes (1928): lean mutton, 15 oz.; orange juice, $1\frac{1}{2}$ oz.; mutton soup, 12 oz.; rusks, $1\frac{1}{2}$ oz.; sprulac, 1 oz.; glucose, $\frac{3}{8}$ oz. per diem.

OTHER DISORDERS

Space only permits a few comments on the diseases due to food poisoning and vitamin deficiency.

Epidemic dropsy, often confused with beri-beri and formerly thought to be due to a toxin developed in improperly stored rice, has recently been shown to be due to poisoning with impure mustard oil which is used in food in the East. Landor and Williams in Singapore have confirmed the work of Lal and Roy in Calcutta. Hawes states the essential substance in mustard-oil poisoning is allyl-isothiocyanate and the changes in the oil take place during cooking at high temperatures.

Lathyrism is due to poisonous substances, possibly a toxalbumose, in the pea (*Lathyrus sativa*) and other pulses. Over-eating of these contributes to its incidence. Famine, certain conditions of cultivation of the peas and, perhaps, lack of vitamin A in the diet, may all be contributory to its onset.

Atriplicism, a condition showing cutaneous and nervous symptoms seen in China, is due to eating the leaves of *Atriplex littoralis*.

Ackee poisoning, the "vomiting sickness of Jamaica," is caused by eating unfit ackee fruit. Only the ripe fruit should be used.

Poisoning from the manioc (bitter cassava) may occur. Starch, tapioca, and cassava cakes are made from it. Failure to remove the contained glucoside and enzyme may, in the presence of water, release free hydrocyanic acid, with subsequent symptoms.

Scurvy, due to deficiency in vitamin C, should be met by

diets containing red and green chillies, oranges, lemons, pawpaw juice, tomatoes, horse-radish, many roots and tubers. Germinating grains have good anti-scorbutic properties. Condiments containing tamarinds, garlic, and coriander also contain variable amounts of the vitamin. Prolonged over-cooking and steaming of vegetables is a definite factor in the production of the disease in African races. Some of the preparations of lime juice now being manufactured are said to lack the anti-scorbutic factor.

Rickets and osteomalacia are more common in temperate than tropical climes. The purdah system, confining the women in dark dwellings (and particularly with deficiency of animal products in their diet), leads to their occurrence.

Pellagra is common where the principal food is maize. Deficiency in vitamin B_2 and B_6 and an ill-balanced diet are regarded as causal factors. Recent work on the pellagra-preventing factor in the vitamin B complex indicates the importance of nicotinic acid. Human pellagra quickly responds to its administration orally or by hypodermic injection. Nicotinic acid has been used in spruc and in idiopathic steatorrhœa, and in certain patients on diets restricted for medical reasons, such as gastric or duodenal ulcer of long standing, pellagra-like symptoms, such as dermatitis of the exposed skin areas, sore tongue, intestinal disturbances, and mental depression are stated to have been alleviated. Foods rich in vitamin B (complex), such as beef, liver, kidneys, egg yolk, milk, cheese, yeast, carrots, sweet potatoes, yams, bananas, red and yellow dals, black gram, soya bean, and potatoes, should be given.

Xerophthalmia.—This eye condition is due to lack of vitamin A and needs a balanced diet with the addition of cod-liver oil in treatment.

Tropical macrocytic anæmia.—Napier (1936) reports that eleven

cases of this condition have responded to marmite therapy. Blackie (1936) of Rhodesia records cases in which the condition was apparently due to diet defective in extrinsic factor.

Beri-beri.—In fulminating cases (shöshin) Hawes found dietetic treatment insufficient but achieved dramatic results in cases of dying patients by the injection of a solution of crystals of vitamin B_1 (Jansen and Donath). Betaxin, synthetic betaxin, benerva and other preparations of the vitamin in certain cases gave good results. Large doses had to be given. For ordinary patients white rice should be omitted from the diet and replaced by items rich in vitamin, such as beans, peas, peanuts, oatmeal, or barley. Eggs, yeast, marmite, animal food, fat, and milk, if available, are valuable. Partly fermented "toddy" (the sap of the coconut spathe) cures and prevents infantile beri-beri. Graduated doses from 2 c.cm. twice daily are given. The following diets, as used by Hawes for hospital patients in Malaya, are just enough to prevent beri-beri occurring, but parboiled rice, prepared in the South Indian fashion, must be used, not white rice, or the disease may appear in the wards.

CHINESE FULL DIET.

6 a.m.	Rice Kanji, 1 oz.
10 a.m.	Beef, 4 oz. or pork, 5 oz. or ducks eggs (2), 4 oz.
	Vegetables, 3 oz.
	Rice, parboiled, 7 oz.
4 p.m.	Dried fish, 4 oz. or fresh fish (fatty), 4 oz.
	Vegetables, 3 oz.
	Rice, parboiled, 7 oz. Caloric value 2,033 to 2,464.

INDIAN FULL DIET.

6 a.m.	Rice Kanji, 1 oz.
10 a.m.	Mutton, 4 oz., or duck eggs (2), 4 oz.
	Vegetables, 2 oz.
	Dal, 1 oz.
	Rice, parboiled, 7 oz.
	Curry stuff, ½ oz.

4 p.m. Dried fish, 4 oz., or fresh fish (fatty), 4 oz.
Vegetables, 2 oz.
Dal, 1 oz.
Rice, parboiled, 7 oz.
Curry stuff, ½ oz. Calorie value 2,183 to 2,380.

MALAY FULL DIET.

6 a.m. Rice Kanji, 1 oz.
10 a.m. Beef, 4 oz., or ducks eggs (2), 4 oz.
Vegetables, 2 oz.
Dal, 1 oz.
Rice, parboiled, 7 oz.
Curry stuff, ½ oz.
4 p.m. Same as 4 p.m. on Indian diet above.
Calorie value 2,183 to 2,327.

EURASIAN FULL DIET.

6 a.m. Rice Kanji, 1 oz.
10 a.m. Beef, 4 oz., or mutton, 4 oz., or ducks eggs (2), 4 oz.
Bread, ⅛ lb.
Butter, ½ oz.; sugar, 1 oz.
Vegetables, 3 oz.
Rice, parboiled, 4½ oz.
4 p.m. Dried fish, 4 oz., or fresh fish (fatty), 4 oz.
Bread, ⅛ lb.
Butter, ½ oz.
Sugar, 1 oz. Calorie value 2,304 to 2,501.

Vegatable calorie value is taken at 8 per oz., but this will vary with the vegetable used.

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CHAPTER XIX

DIET IN OLD AGE

By HUGH DUNLOP, M.D., M.Sc., F.R.C.P.

To the physiologist diet means the food ingested. The term therefore covers, not only the spartan regime dear to contemplation albeit hateful to practice, but also everyday meals. Age is computed in years but the age which may be said to be old is a contentious matter. Pigment and the arts of dentist, oculist, and beauty surgeon may mask or accentuate the appearance of age. And apart from these, constitution, circumstance, and hygiene play their part. That one man is older at fifty than another at seventy is a commonplace truth which must be taken into account in the management of the aged : if they desire to or can be managed.

Nevertheless, even in the most independent, age makes itself felt and may be held to include the last two stages described by Shakespeare. Not all the old contemporaries are lean and slippered pantaloons but their metabolic needs are less than in the full exuberance of youth. Presbyopia and a reduced metabolism are two of the characteristics of age. The "last scene of all, that ends this strange eventful history" is not affected by diet and it is proposed to discuss only the sixth stage.

THE ENERGY METABOLISM OF OLD PEOPLE

The energy requirements of age are less than those of vigorous maturity for two reasons : (1) the basal metabolic rate is less, and (2) exercise and labour are less.

(1) The basal metabolic rate is remarkably constant per square metre of body surface per hour, between the ages of twenty and forty. Thereafter it shows a slow progressive decline. The activity of the tissues even at metabolic rest is slowing down, prior to final extinction. The basal metabolic rate of a man between the ages of twenty and forty averages 37.7 calories per square metre per hour. At eighty years the figure has fallen to 33.7, a decrease of roughly 10 per cent. This may seem a small decrease, but it must be remembered that it is a fall of capital value and one which cannot be regained. With it go a decreased sense of vitality and diminished capacity for work. If the basis is contracted the superstructure must also be narrowed.

(2) The muscular work of age is less than that of youth and middle age. This is quantitatively more important than the decrease of basal metabolism referred to above, but the two are intimately related as already explained. The two together render the aged tissues inelastic to metabolic strain.

THE COMPOSITION OF THE DIET

The proportions of protein, fat, and carbohydrate will not be specially considered except in special cases. Vitamins are needed in moderation. On theoretical grounds excess of vitamin D would be harmful as promoting calcification. Vitamin B should be liberally given when constipation and other alimentary symptoms are prominent. Nor must the vitamin C content of the diet be neglected. I have recently seen scurvy in an old lady living alone. The amount of salt may be left to the taste of the individual in most cases but should be restricted when œdema or obesity is present. A moderate increase of salt is indicated in the hot weather when salt is lost by sweating and then Ringer's solution is a better beverage than plain water.

As a general rule a liberal intake of water is advisable. This need not equal the three quarts said to be recommended by the late J. D. Rockefeller. The volume should be approximately four pints, but weight and climate modify the amount required. Water should be taken after, rather than during, a meal. The usually given advice to sip fluids should be avoided as this leads to ærophagy. Nor should they be swallowed in Homeric draughts.

PRACTICAL CONSIDERATIONS

Science teaches us what we knew before, that old people should be moderate in their eating. How are they to achieve moderation ? Some will achieve it spontaneously, others will need advice. A weighed diet is as a rule unnecessary. A diet sheet is usually unnecessary but should be supplied if desired. Definite advice should be given as to the number of meals per diem. Four, better three, is the maximum and one of these should be very small. The Russian writer, Gogol, has given a picture of the metabolic economy of two old people who all day long urged each other to eat. They truly dug their graves with their teeth. Children and hosts of the elderly should also avoid this example. Above all, the old should not be urged to liberal feeding.

The meal should be discontinued, not at the point of distention nor at the end of satisfaction, but rather when hunger has been blunted. Besides the baneful effect of excessive stoking on elderly metabolism, the accumulation of fat is to be deprecated. To quote Hutchison and Mottram, leanness and longevity go together—as Shakespeare knew—although there are exceptions to this rule. As these dietitions say, excess of fuel chokes, not feeds, the flickering flames. It is tempting to think of accumulation of fat round the myocardium, but obesity is a mystery and even the thin old man cannot overeat with impunity.

In certain pathological cases, in which the appetite is excessive, the doctor is faced with an ethical difficulty. For example, arteriosclerotic disease of the brain may, by destroying the inhibitions acquired in adult life, release the nutritional instinct so manifest at the age of ten. Is the physician to imprison the appetite in walls of hunger ? Or is he to make the old man happy ? I think the latter.

Apart from these pathological instances, it must be realized that a large meal is in itself harmful. Not only may it set up abdominal pain or disturb sleep, but in some way it affects—perhaps through the vagus—the action of the heart. It is common knowledge that an anginal attack is specially prone to develop after exertion on a full stomach.

Rest after meals is indicated in old age and when possible friendly conversation during them.

Should marked anorexia be present the occasional use of the bitters, e.g. gentian, before meals, is permissible.

Certain indigestible articles of diet should be avoided, such as new bread, fried potatoes, and tough meat. If constipation is present, it is better controlled by a mild aperient than by taking a large excess of cellulose, should the latter cause discomfort.

Condiments, except in moderation, and strong tea and strong coffee should generally be condemned. In certain cases of dyspepsia condiments seem to do good. The food should be easy to masticate.

ALCOHOL

The use of alcohol in age, as in youth, is the subject of controversy. In the thinking of some authors alcohol has to be fought with religious fervour, others regard it as a balm and a blessing. Bacchus has been variously regarded as a god or a demon. Nevertheless. the experience of mankind throughout

the ages has on the whole favoured the use of alcohol in moderation.

Alcohol has a limited food value as well as a potent drug action. An average individual can oxidize about 10 c.cm. per hour. The food value of alcohol is a justifiable indication for its use only in illness. Even then glucose would be more effective, although in many cases less pleasurable. As a drug alcohol is a reflex stimulant, acting on the nerve endings in the upper alimentary canal, and also affects digestion. These actions coupled with the psychological effects render it suitable for occasional use to assuage the feelings of exhaustion which often disturb the aged. Alcohol is not a true cerebral stimulant ; the whole body of scientific evidence shows that the action is that of an anæsthetic and that such apparent evidences of central excitation as occur are due to release of lower levels by weakening of the higher control. When the higher controlling centres are already grossly weakened, as in arteriopathic and senile dementia, the use of alcohol is contraindicated as it often produces mental confusion.

Alcohol like other anæsthetics has a hypnotic action and this is perhaps its most valuable property so far as the old man is concerned. In many cases of insomnia the occasional administration of a hypnotic is preferable, but in others a small dose of alcohol at night has a sufficient sedative effect.

The weight of scientific evidence is on the whole against the old idea that withdrawal of alcohol from those long accustomed to it is harmful. Nevertheless, many physicians have formed the impression that sometimes withdrawal symptoms may occur. It is certainly true that the prohibition of alcohol to an old man long accustomed to moderate doses is in most cases inadvisable. It may be that the prop struck away is a psychological one, but it is best not to remove it. There is no proof that alcohol protects against infection. Heavy

drinkers who escape an early death are probably examples of the survival of the fittest. It would seem that alcohol in small doses should not be withheld from the aged, if it proves a comfort to them.

There remains to be decided the form in which the spirit is to be enclosed. The most suitable preparation is whisky. Not more than two small doses well diluted should be taken in the twenty-four hours and preferably only one—at bedtime. The whisky should be diluted ; to those able to take only neat whisky, water should be taken immediately after the spirit is swallowed. When faintness requires relief, brandy is advisable.

SMOKING

Often as age advances there is a diminished tolerance to tobacco smoke. Should untoward results accrue, such as premature contractions, or "tobacco angina," smoking should be diminished or discontinued. According to Stoddart, the use of tobacco should be prohibited to cases of senile dementia in which smoking often causes mental confusion. In any case smoking is a rite which is most suitably performed on a full stomach, not on an empty one, and care should be taken that in lighting his pipe the old gentleman does not ignite his clothing.

DIETETIC PRINCIPLES IN DISEASE

(1) In cases of senile tuberculosis the calorific value of the diet should be increased. This is also true in elderly diabetics who have tuberculosis, the increased diet being balanced by insulin. If the patient is kept in bed the diet should be above basal level. The protein should not be restricted. Digestibility is a primary consideration. There is no need to over-feed.

(2) A diet of low calorific value is indicated for obesity, heart failure, chronic bronchitis and arteriosclerosis. Normal

quantities of protein of good biological value—gelatine, for example, would be unsuitable—are, however, needed. So also are fresh fruit and moderate quantities of milk to supply vitamins.

In azotæmic renal disease prolonged restriction of protein is inadvisable and not only fails to control the uræmia but also leads to wastage of tissue protein. Therefore an adequate supply of protein of good biological value is indicated. Here we see a confirmation by physiology of the old clinical dictum that in a chronic disease consideration for the patient as a whole is more important than theoretical rest for a diseased organ.

(3) Mild diabetes in the old is often controlled by a low carbohydrate diet without insulin.

(4) For constipation the residue in the diet should be increased and liberal quantities of vitamin B supplied. Aperients are often necessary. In many cases, an ordinary diet plus aperients gives better results than a high residue diet.

(5) For diarrhœa a low residue diet is required and drinks and foods which produce flatulence should be avoided. Such drinks and food include beer, effervescent minerals, cheese and sweets. Arrowroot, milk and blackberries are regarded as of value in diarrhœa. Essex Wynter spoke highly of the value of arrowroot.

(6) For dyspepsia [see p. 248].

It is important to remember that monotony in a severely restricted diet leads to indigestion and misery. Further in spite of all that is advised, the aged often refuse the well-meaning checks of the physician and prefer eating "good and hearty" to living long lean years. Wise was the remark made by a doctor to an old lady who asked what she should eat : "if you don't know at 70, you never will."

DIETS

A SIMPLE 100 GM.-CARBOHYDRATE DIET.

(After J. W. Linnell.)

		C.H.
Milk	½ pint	15 gm.
Potatoes or peas or broad beans	7 oz.	30 ,,
Bread	2 oz.	35 ,,
One orange or grape-fruit	6 oz.	10 ,,
or Apple or Pear	4 oz.	
Onions or Carrots	6 oz.	10 ,,
		100 ,,

As much as you like of :—

Asparagus, French beans, cabbage, cauliflower, celery, cress, greens, horse-radish, lettuce, marrow, radishes, rhubarb, scarlet runners, seakale, spinach, tomatoes, water, weak tea or coffee.

The following should be taken in moderate quantities :—

Bacon, fish, mutton, chicken, butter, cream, etc. (i.e. fat and protein foods).

All sweetening must be done with saccharine ; NO sugar must be used.

DIET FOR ARTERIOSCLEROSIS

Breakfast.

Stewed apricots or prunes or cornflakes with cream and sugar. Egg on toast or scrambled egg or fish. Weak tea and cream and sugar.

Luncheon.

Celery or asparagus soup, vegetable salad, Brown bread and butter. Fresh fruit salad or rice pudding with cream.

Tea.

Tea with lemon and sugar. One thin slice of bread and butter. Marmalade.

Dinner.

Lamb chop or chicken, or halibut or sole. Potato in jacket or boiled. Pineapple or apple with cream. Weak coffee with cream and sugar.

DIET FOR DYSPEPSIA

Breakfast.

Boiled fish or egg (excluding hard-boiled) or bacon. Toast or stale bread (one slice) and marmalade. Weak tea or weak coffee.

Luncheon.

Chicken and bread sauce or lamb with one boiled potato and cauliflower (not the stem) or young scarlet runners. A little stewed apple or a digestive biscuit.

Tea.

Weak tea with milk and one lump of sugar. A thin slice of bread and butter.

Dinner.

Boiled or steamed fish, thin bread and butter, or mutton chop or cutlet. Blancmange or stewed apples or junket. Water to be taken between meals.

DIET FOR CONSTIPATION

On waking take a cup of hot weak tea or if preferred water.

Breakfast.

"All-bran." Two stewed prunes and cream A little brown bread, butter and marmalade. Weak tea or coffee.

Lunch.

Chicken or lamb, with cauliflower (or cabbage) and a slice of brown bread (or two rivita biscuits) and butter. Stewed apples or pears or a fresh apple.

Tea.

Brown bread and butter with marmite.

Dinner.

Fish and a slice of brown bread and butter. Bemax and milk.

Plenty of water or Vichy water should be taken between meals.

The following two diets are examples of low carbohydrate diets used at Charing Cross Hospital :—

A

Carbohydrate - - - - - -	38 grammes
Fat - - - - - - -	118 grammes
Protein - - - - - - -	72 grammes
Calories - - - - - - -	1500

Breakfast.

Tea or coffee, *ad lib.*
Milk, 2 oz.
Eggs, 2.
Bacon, 1½ oz.
Tomatoes, 3½ oz.
Orange, 2½ oz.
Butter, ¼ oz.

Dinner.

Soup—Hot water and marmite or beef extract, *ad lib.*
Lean meat, 2 oz.
Butter or fat of meat, ⅓ oz.
Potaotes, 1½ oz.
Salad cream, 1 oz.
Apple, 2 oz.

Tea.

Tea, *ad lib.*
½ Vita-weat biscuit.
Milk, 2 oz.
Cheese, 1 oz.
Butter, ¼ oz.

Supper.

Steamed fish, 3 oz.
Potatoes, 1 oz.
Butter, 1 oz.
Custard—1 egg, milk, 2½ oz., water, 2½ oz., vanilla or saccharine to taste.

B

Carbohydrate - - - - - -	49 grammes.
Fat - - - - - - - -	144 grammes
Protein - - - - - - -	75 grammes
Calories - - - - - - -	1800

Breakfast.

Tea or coffee, *ad lib.*
Milk, 2½ oz.
Eggs, 2.
Bacon, 2 oz.
Tomatoes, 7 oz.
Orange, 2½ oz.

Dinner.

Soup—Hot water and marmite or beef extract, *ad lib.*
Lean meat, 2 oz.
Butter or fat of meat, ½ oz.
Potatoes, 1½ oz.
Lettuce, *ad lib.*
Salad cream, 1 oz.
Orange, 2½ oz.

Tea.

Tea, *ad lib.*
Milk, $2\frac{1}{2}$ oz.
1 Vita-weat biscuit.
Cheese, 1 oz.
Butter, $\frac{1}{2}$ oz.

Supper.

Steamed fish, $3\frac{1}{3}$ oz.
Junket—milk, 5 oz., whipped cream, 2 oz., saccharine or vanilla to taste.
Potato, 1 oz.
Butter, $\frac{1}{4}$ oz.

These (A and B) are basal diets. The addition of 3 oz. of bread would increase the carbohydrate content by 45 gm. and the salorific value by at least 180.

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CHAPTER XX

GENERAL PRINCIPLES OF DIET IN CHILDHOOD

By B. RIVET, B.A.

THROUGHOUT childhood the diet must be composed of the same essential constituents, the amount increasing with the age of the child. The diet must provide sufficient calories, derived mainly from carbohydrate and fat foods, protein for growth and repair of tissues, and mineral salts, vitamins, and water to maintain the body in good health. To ensure that all the elements are present, general mixed feeding from an early age is desirable, with the inclusion of a good choice of protein foods, cereals, fruit and vegetables.

DIET OF INFANTS

The diet in infancy consists of milk, which contains adequate amounts of all the essential elements, except iron, in good, digestible proportions. At three months, or earlier, in bottle-fed infants, the vitamin C content of this diet is supplemented by the addition of fresh orange juice. The juice is best given diluted and sweetened, beginning with one teaspoonful ; the amount should be increased gradually, until at six months, the juice of a whole orange may be given. Orange juice, or later on a whole orange, should be included in the diet at all ages, as it has been shown that the optimum requirement of vitamin C per day is contained in one orange. Tomato juice may be substituted if orange is not well taken. It has been shown that

more vitamin C is utilized during feverish conditions, and therefore more should then be given. It is important that the fresh fruit juice should be given, as the vitamin C is quickly destroyed by heating, and by oxidation if the juice is allowed to stand in air. Fresh fruit juice, strained if necessary, should always be included in special diets.

From four months, or from a few weeks in bottle-fed infants, a teaspoonful of cod-liver oil should be given twice daily, to supplement the contents of vitamins A and D in the diet. This may be discontinued in hot weather, but it is necessary in England except for a few months in summer. It is advisable during the school years, when growth is rapid, and children spend many hours indoors during term-time. Usually one of the good preparations of cod-liver oil and malt* are well taken and seem preferable to the concentrated preparations ; the indiscriminate use of such preparations is not advisable. The natural sources of vitamins A and D in the diet are milk and milk products, especially butter, eggs, animal fats and glandular organs ; green vegetables contain carotene, a precursor of vitamin A. The fat-soluble vitamins are not quickly destroyed by ordinary cooking. In cases in which cod-liver oil or fats of any kind are not well taken, a concentrated preparation such as halibut oil may be given. These preparations have the advantage that they can be mixed with the food without the knowledge of the child if there is difficulty in giving cod-liver oil. Halibut oil should also be used in special diets involving restriction of fats, such as low calorie diets for weight reducing, or in jaundice or fat indigestion.

The vitamin B requirement of the diet is supplied by milk

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* It should be noted that the usual cod-liver oil and malt preparations contain only 10 per cent. of cod-liver oil. For protection against rickets, the plain cod-liver oil emulsions or pure cod-liver oil are better and should be given to children under two years of age.

and orange juice, and later by eggs, vegetables and whole cereals. It is not quickly destroyed by cooking and oxidation, and is fairly widely distributed in different foodstuffs. Marmite which is a good source of the vitamin, should be given occasionally, spread on bread and butter, or in milk as a drink, or in gravy. It should be remembered that a cup of marmite in water is not a fair substitute for a cup of milk. A teaspoonful of marmite should be included daily in "low residue" diets as there is a tendency to deficiency of vitamin B here, and it also helps to stimulate the appetite.

THE SECOND SIX MONTHS AND ONWARDS

Eggs should be introduced into the infant's diet from six months of age : beginning with a minim of yolk in the milk, and, increasing slowly, a whole egg, lightly boiled, may be given after fifteen months. Eggs are an important constituent of the diet, supplying protein of high biological value, phosphorus, calcium, and iron in an available form, and vitamins A, D, and B in the yolk. Until about two years of age the child's diet should contain two to three eggs per week, including those used in cooking, and after this an egg every day may be given if well tolerated. Eggs do not suit all children equally, and should not be forced, but if a child is upset by an egg once it should be tried again later.

At six months or earlier, the iron content of the infant diet is increased by the gradual addition of bone broth, sieved vegetables and fruit purées, of which many good tinned brands are now available. Vegetables remain an important source of iron and other mineral salts at all ages. Up to two years of age they should be well cooked and mashed or sieved : after this age cooked vegetables need not be sieved, and small amounts of raw salads may be introduced. Until five years of age large quantities of uncooked vegetables are not advisable, but

during school years salads and cooked vegetables form an important part of the diet of the normal child, supplying vitamins, mineral salts, water, and roughage. Stewed or baked apple and prune pulp may be introduced gradually at six to nine months, and small amounts of fresh fruit at about twelve months. Until five years, fruit should be cooked unless it is soft and ripe ; a small piece of raw apple or other fruit without pips may be given at the end of a meal. The practice of some welfare clinics of advising raw apple for babies is not satisfactory ; in some cases a child of twelve to fourteen months, who has very few teeth, is given a whole raw apple, sometimes at bedtime, and the mother complains that the child suffers from indigestion ! After five years of age, fresh and stewed fruit supplies the same needs as vegetables. Cheap jams contain a high proportion of sugar in relation to fruit, and should not be allowed in large amounts, because sugar tends to blunt the appetite for fresh foods. Honey and jelly jams are most suitable for young children.

CEREALS

Cereal foods are introduced into the diet of the infant at about six months of age. These foods add calories to the diet, but little else, as the iron and vitamins contained in the whole grain are more or less removed by milling. From this time on starch foods supply a large proportion of the calories in the diet at all ages. The fine cereals, requiring little cooking, such as groats, patent barley and farex, should be introduced first in small amounts, and a variety should always be used. As soon as a tooth is cut, Robb's biscuits, rusks, or baked bread spread with a little butter or honey may be given. Potato should be used to thicken the broth from about eight months. Throughout childhood, potato at one meal of the day is a sound rule, as it contains more iron, protein and vitamins than white bread, it is not so doughy, and it is not accompanied by

sugar or jams. In some diets the ratio of carbohydrate to fat and protein foods is high for reasons of economy, as cereal foods are cheapest to buy and to produce. In many cases, however, other foods are available, but the child is allowed to indulge a fancy for bread, jams, cakes, and sweets at all times of the day. The result is a loss of appetite for the so-called protective foods, milk, meat, eggs, fruit and vegetables, and a pasty-faced child with poor teeth. The modern child receives more pocket money than the parents did, and spends a good proportion on cheap sweets, a habit which many parents seem unable, unwilling, or too ignorant to control. The solution would seem to be nutrition classes where children may learn to choose the right foods for themselves. A reasonable amount of carbohydrate foods in the day, with wholesome sweets given after meals, and not in bed after cleaning the teeth, is most desirable. The objection to large amounts of sugar, jams, and sweets is that they contribute nothing but calories to the diet; they occupy small bulk, and therefore tend to be taken in excess, in which case they spoil the appetite for the protective foods; if taken between meals they spoil both digestion and teeth.

The question of white or brown bread is often raised, and it should be remembered that there are two types of brown bread. Wholemeal bread is made from flour containing the whole grain and sometimes added husk, whereas Hovis bread is made from white flour to which wheat germ has been added. Hovis bread may therefore be used with advantage at all ages, and also in special diets requiring little residue. Wholemeal bread is suitable for normal children over five years of age. The main dietetic value of brown bread lies in its content of vitamin B, and this is often higher in Hovis than in wholemeal bread. Where the child's diet must contain a large proportion of bread for economic reasons, wholemeal bread can supply

some of the roughage which in a more liberal diet would be provided by fruit and vegetables, for normal children. It should be remembered, however, that giving wholemeal bread to a poorly nourished child may do more harm than good, by putting strain on a digestion already impaired by malnutrition.

The prepared cereals may be divided into two classes, those containing the whole grain such as shredded wheat, and those with the husk removed, such as cornflakes. The former are excellent for children of school age with normal digestion, the latter for younger children. Prepared cereals should usually be given only once daily, either at breakfast or supper. Their value is increased because they are eaten with fresh milk or fruit, and they do not require much sugar. In winter hot oatmeal porridge is a good economical old-fashioned substitute.

MEAT AND FISH

Meat is introduced into the diet of the infant at about twelve to fifteen months of age in the form of small amounts of pounded chicken, scraped beef, liver or brains. The amount should be increased gradually, and by two years of age minced or finely cut up ordinary meat may be given. Meat provides protein of high biological value, also iron and other mineral salts, and vitamins in the glandular organs and fat: meat and meat broths also have a stimulating effect on the appetite. Throughout childhood it is desirable that a helping of fresh meat should be given five times a week, and liver should be given once a week, for its vitamin content and its value in counteracting anæmia. The glandular organs, liver, kidneys, sweetbreads, are not as popular as they deserve to be, for they are rich in vitamins, and really give better purchasing value than muscle meats. Pork, stuffed and spiced meats are not suitable for children, and should only be allowed occasionally. Sausages

and twice cooked meats should not be considered as the meat meal of the day. It is quite frequent to find children who do not eat meat, and who dislike it; such children are often overweight, and may be big eaters of bread and butter or always eating sweets. Sometimes the parents are vegetarians, but more often the child is spoiled and difficult to manage generally. When questioned such children usually say they eat corned beef, meat pies, sausages, when a normal child would eat meat.

Fish is introduced into the infant diet at about the same time as meat. It is a good source of protein and phosphorus, and the fat fishes, herrings, sardines, salmon, contain the fat-soluble vitamins A and D. Fish is good once or twice a week, but its value is often overrated, especially when cod fillets are used which contain practically no fat and, therefore, no vitamins. Fish tends to be substituted for meat, which is of greater value if only for its iron content; it is often erroneously believed that fish is much more digestible than meat, which is not so.

MILK IN LATER CHILDHOOD

The importance of an adequate amount of milk throughout childhood is high. Probably the greatest value of milk is that it is the richest source of calcium in an easily assimilable form; but milk also contains protein of high biological value in a digestible form, and mineral salts, and all the vitamins. The vitamin content of the milk varies with the season and the feeding of the cow; pasteurization, to which most milk sold in towns is subjected, reduces the vitamin C content somewhat. Experiments on children of various ages have proved that optimum calcium storage is only obtained when at least 1¼ pints of milk are included in the daily diet. The League of Nations Report on Nutrition in 1936 suggests 1 litre (approx. 1¾ pints) milk per day as the standard requirement. Vegetables and fruit are the next best source of calcium in the human diet,

but replacing some of the milk by vegetables containing an equivalent amount of calcium did not produce such good results experimentally. When considering vegetables as a source of calcium it must be remembered that their bulky nature makes it difficult to supply much calcium in this way. Analysis of a specimen diet, such as might be given to a child of seven or eight years, gave the following results. The diet included 1 pint of milk, and supplied about 1,700 calories.

Supplied by 1 pint of milk	- -	676·0 mgm. calcium
Supplied by fruit and vegetables	-	78·1 mgm. ,,
Supplied by 1 egg	- - - -	28·5 mgm. ,,
Supplied by various other foods	-	79·8 mgm. ,,
Total calcium	- -	862·4 mgm. ,,
Standard calcium req.	-	1,000 mgm. ,,
Deficiency	- - -	137·6 mgm. ,,

The fruit and vegetables in the diet consisted of orange juice on waking, stewed fruit, potatoes and green vegetables at dinner, and fresh fruit at tea-time; this amount of fruit cannot be greatly increased at this age. Judged by the standard requirement of 1 gm. calcium per day, this diet is deficient by about 140 mgm. calcium per day, and the easiest way to supply this is to add another $\frac{1}{4}$–$\frac{1}{2}$ pint milk to the diet. The other important source of calcium is eggs, which are sometimes not tolerated more than three times a week; but bacon and tomatoes, which are often substituted for eggs, are not so rich in calcium. Half an ounce of cheese (one chedlet portion) would supply 115 mgm. of calcium, and might well be included when egg is not given. Cheese is not given to children as often as it might be, partly because it is an acquired taste, and partly because it is believed to be indigestible. Actually the cheap, crumbly cheese is well digested if given in small amounts, and cream cheese is suitable for young children, although the calcium content is not so high. Cheese is a good source of protein, calcium, and the fat-soluble vitamins.

It is sometimes stated that the inclusion of $1\frac{1}{4}$–$1\frac{1}{2}$ pints of milk per day spoils the appetite; actually a poor appetite is more often due to excessive sweet-stuffs. The milk should not be given all as plain milk, nor as stodgy milk pudding, too often over-cooked. It is not always realized that the value of milk puddings lies in the milk consumed rather than the cereal. Simple milk sweets, requiring little cooking, such as milk jelly, junket or blancmange, are often popular, and are more digestible than those which have been cooked for a long time. Plain water jellies, made from packets, have very little food value: they consist of sugar and gelatine, an incomplete protein. Sponge cake and fruit set in jelly increase the calorie value and cream may be served with it. For sick children, attractive jellies may be made from fresh fruit-juice and glucose, either added to packet jellies, or coloured and set with gelatine. For diabetic children or children on low calorie diets, jellies of negligible food value may be made from orange or lemon juice and water, sweetened with saccharin and set with gelatine, and coloured. Milk sweets can be decorated with jelly, coloured, served with fruit, syrup, or jam to increase their attractiveness. For example, such sweets as boiled rice and treacle, queen of puddings, chocolate blancmange, sponge trifle are generally popular. Baked custard is often unpopular; boiled egg-custard or custard-powder to which egg may be added, contains the same amount of milk. A good cup of milk should be given at breakfast and tea, a prepared cereal or porridge with milk at breakfast or supper, and at least one pudding made with milk should be given at dinner or supper. In this way it is not difficult to include the minimum $1\frac{1}{4}$ pint per day, and many children now have, and like, milk in the middle of the morning at school. The breakfast and tea milk may be flavoured with cocoa, ovaltine, or weak tea. The practice of allowing and often persuading, children of ten

years and older to substitute tea for milk is a bad one, as the milk consumption is unconsciously reduced. There is no reason why the child should not continue to drink milk all his life if he likes it, and many adults would probably be healthier if they drank milk instead of tea. When constructing special diets, such as reducing, ketogenic, and diabetic diets, $\frac{3}{4}$ pint milk should be taken as the minimum; skimmed milk may be used if the fat content must be low. If milk must be excluded as in allergic conditions, calcium should be given in concentrated form.

Children should be encouraged to drink plenty of cold water during the day, mainly between meals: usually one glass of water with the midday meal may be taken without causing indigestion. The habit of drinking a glass of cold water on rising should be formed, as this helps to prevent constipation.

COOKING AND SERVING

It is obviously useless to supply the correct food to a child, unless proper attention is given to the cooking and serving of the food, and to the management of the child. In cooking the food it is a sound general rule that the shortest time required for cooking which will make the food tender is the best time. Milk puddings should be cooked till the grain is soft; over-cooking makes the milk indigestible and destroys the vitamins. Fruit and vegetables should be cooked until soft; prolonged cooking destroys the vitamin C. Grilling is a good method for cooking meat, as the outside is seized by the sudden heat and the juices retained. In the preparation of scraped beef the meat should always be put under a hot grill for a few minutes before scraping. It is important that stewed meat should not cook too quickly or too long, as it becomes leathery and indigestible. Fried foods, pastry, and rich cakes are not

suitable for young children, and should never be allowed more than about five times a week for older children.

The food should be served attractively and in helpings suitable to the age of the child. It is much better to give a small helping to be finished up, and to allow a second helping, than to give one large serving through which the child struggles slowly. As with adults, variation in colour, type of food, and temperature should be considered, although many small children do not appreciate much variation. A general rule should be established to try a little of any new food, and to eat up a small helping of an unpopular one. A reasonable amount of likes and dislikes should be allowed, as there are some children who cannot tolerate eggs or face tapioca pudding; the child should be allowed some independent choice, and he should be encouraged to choose the right foods for himself. The value of example is great. At a nursery school of forty children it is almost unknown for a child to refuse to drink his milk, at an age when many better-class children are being persuaded to drink theirs up. The nursery-school child drinks his willingly, mainly because he sees his companions drinking theirs, also because he is usually served by one of his fellows, and no one apparently is worrying about whether or not he will drink it. The effect of example must also be considered when children have their meals with adults. A child is a rational being, and it is hardly fair to expect him to finish up his dull milk pudding if others around him are allowed to refuse it, and choose something else which seems more attractive to the child because he is told it is not good for him. When possible children should have meals with other children, or it should be arranged that adults at the same table can eat the same food.

Finally, something may be said on the arrangement of meals. Breakfast should be a good meal, consisting of cereal

or fruit with milk, egg or bacon or other dish, and toast or bread and butter with marmalade. It is important that the child should get up in time to eat his breakfast reasonably slowly, and also have time for a bowel movement before leaving for school. A cup of milk or fruit may be allowed at mid-morning if it does not spoil the appetite for dinner. If possible the main meat meal of the day should be the midday dinner. This should consist of fresh meat or fish, potatoes and another vegetable, and a suitable pudding, such as sponge puddings, fruit and milk puddings. Suet puddings should not be given before strenuous exercise. Until about nine or ten years of age, a tea-supper may be given, but after this, a smaller tea and a light supper may be introduced. These arrangements must obviously be modified by home and school conditions. If the child attends a day school there may be the alternative of a rather poor school-dinner, often followed by exercise, or a sandwich lunch; in other cases the child reaches home in time for a hasty meal, and rushes back to school again. Under these conditions it is much better to give a light or sandwich lunch, and a meat and vegetable meal at about five or five-thirty, with something light at bedtime for older children.

CHAPTER XXI

BREAST FEEDING

By C. K. J. HAMILTON, *M.C.*, B.M., F.R.C.P.

FEW who have had experience in the management of infants will deny the importance of breast feeding, but there are many who, while acknowledging its importance in theory, do little in practice to encourage it. As soon as difficulties arise mothers are all too apt to be advised to wean their infants and substitute artificial feeding. Reference to any series of figures will show beyond all shadow of doubt that both the mortality and morbidity rates are immeasurably lower among breast-fed than in bottle-fed infants.

CONTRA-INDICATIONS TO BREAST FEEDING

In the first place it can be said with confidence that as far as the infant himself is concerned there is no contra-indication to breast feeding. Certain sick and weakly children may be unable to suck properly, but in these cases the milk can be expressed from the mother's breast and given to the infant. Any serious illness in the mother must be considered on its own merits, and if there is any reason to believe that her health really will suffer, the baby must be weaned. In the case of pulmonary tuberculosis in the mother the infant ought to be weaned, but it must be remembered that he should be taken completely away in order to prevent his becoming infected from his mother.

Some deformities of the breast, such as badly retracted nipples, may make breast feeding impossible, but here again

much can be done by expressing milk from the breast and giving it to the infant.

It is argued by some that it is unwise to encourage breast feeding in mothers of poor physique living under bad hygienic surroundings, on the assumption that the breast milk will be of inferior quality. This advice would appear to be unsound both from the scientific and the economic points of view. The composition of breast milk, except possibly in the case of certain vitamins, bears little direct relation to the mother's diet; a poor diet in the mother does not necessarily mean breast milk of poor quality. Economically, surely it is much wiser to let the mother buy extra food for herself with the money which she would otherwise spend on artificial food for her infant.

PHYSIOLOGY OF LACTATION

During pregnancy the ovarian hormones are responsible for the development of the mammary gland and at the same time have an inhibiting effect on lactation, but after the birth of the child their influence ceases and the initiation of lactation is due to the pituitary secretion prolactin. The maintenance of lactation, however, depends upon the reflex supplied by the sucking of the infant coupled with the complete emptying of the breast. This, no doubt, is brought about through the agency of the pituitary secretion, but the practical point is that it is the removal of the milk from the breast that is responsible for the continuation of lactation. The continuance of the supply also depends to a very great extent upon a state of mental rest in the mother. It is well known that fear and disturbance will very adversely affect the milk yield in cattle and much more so will some mental upset temporarily affect the mother's supply of milk. The importance of adequate stimulation is well illustrated by the results obtained in certain countries, where a large number of mothers from the beginning of lactation

express after every feed and send their surplus breast-milk to the hospitals. The percentage of these mothers who continue to feed their infants on the breast for from six to nine months is high and this would seem to go to prove the truth of the adage that the supply to a great extent equals the demand.

THE DIET OF THE MOTHER DURING LACTATION

The guiding principle in prescribing the mother's diet is common sense. Nothing must be overdone; many mothers feel that they must eat enormous quantities of so-called nourishing foods, and frequently give themselves indigestion in so doing. The diet must be a good all-round one containing an adequate amount of animal protein, milk, eggs, cheese, meat, and fish, as well as fresh fruit and vegetables. It is not possible to alter directly the composition of the mother's milk through her diet. It is impossible, for example, to increase the fat content of the milk by providing more fat in the mother's diet. Animal experiments, however, show that if the protein content of the diet is low there is a tendency for the total amount of milk secreted to fall. It has been estimated that the mother's diet should furnish 2 gm. of protein for every gramme of milk supplied.

In ordinary circumstances it is not necessary for the mother to restrict her diet in any way. Here again common sense is the answer; if any food quite definitely disagrees with the mother or her baby it should be eliminated, but every upset in the infant must not at once be put down to something that the mother has eaten.

The vitamin content of the mother's diet must be adequate, but a good general diet will provide sufficient of these. It is unnecessary for her to take vitamin preparations, and money is better expended in the form of food.

The use of aperients by the mother needs watching. Many aperients seem to upset the infant. Phenolphthalein has been shown to be one of the most satisfactory aperients for the nursing mother. Finally, there is the question of smoking; heavy smoking is certainly to be deprecated, as it has been shown that the products of tobacco enter into the milk, and it can hardly be doubted that they would prove to be injurious to the infant.

ESTABLISHMENT OF LACTATION

Lactation is, as a rule, established about the third or fourth day, but it may be considerably delayed. Delay need not in any way be taken as an indication that breast feeding will not be ultimately successful. The infant should be put to the breast within six to twelve hours after birth, as soon as the mother has recovered from the fatigue which she has just undergone. It is well not to delay too long in putting the baby to the breast, as it is important that the nipples should be drawn out before the breasts become engorged. H. Waller has lately expressed the opinion that the viscid secretion should be expressed from the ducts for some days before and after the birth of the infant and that by so doing the tendency to engorgement is diminished and the establishment of lactation facilitated. During the first few days the infant will be getting little fluid and if he is not to suffer from this he should be given some additional water or normal saline. As there is little milk at first it is important that the infant should not be left at the breast too long or the tender nipples may be injured and, further, he may give up in disgust as he is getting so little reward for his labours.

MAINTENANCE OF LACTATION

The first point which must be decided is how often the infant

should be fed at the breast. A good working rule is that if he weighs seven pounds or more at birth he will, as a rule, thrive on five feeds in the twenty-four hours, four-hourly during the day, with an eight-hour interval at night. The eight-hour interval at night gives the mother an opportunity for adequate sleep which is so necessary for her health, and the four-hour intervals during the day give her time to get something done in between feedings. The average infant under six pounds seems, as a rule, to thrive rather better on three-hourly intervals during the day, that is six feedings, with the eight-hour interval at night as before. The lusty infant in between these weights will, as a rule, do well on five feeds, and the less lusty one will benefit by six feedings.

No hard and fast rule can be laid down about the length of time which the infant should take over his feeds, the important point being that the breasts should be completely emptied. Ten minutes at each breast should be adequate for this if the infant is suckling properly, any longer period usually means that he is not doing so. It has been shown that the average baby takes about fifty per cent. of the total amount from the breast in the first two minutes, and that after eight minutes few get any milk at all. Taking feeds too fast has its own dangers in that the infant may swallow a lot of air, with subsequent pain and possibly vomiting, but too slow consumption of the milk is at least an equally common cause of trouble.

Regularity in feeding is sometimes criticized; it is said that it is more natural that the infant should feed when he feels like it. This may be all very well in theory, but it seldom works well in practice. Regularity tends to mean that the child wakes up for his feedings at the same intervals and sleeps in between the feeds. The advantage of this to the mother with household duties to perform is obvious. Another important point is that if the infant is fed at regular and not too frequent intervals

there is much greater likelihood that the breast will be emptied completely.

DIFFICULTIES IN BREAST FEEDING

The course of breast feeding, unfortunately, by no means always runs smoothly, and many difficulties may arise and lead to a decrease in, and finally a complete failure in, the supply of the breast milk. The great majority of these failures are due to some factor which prevents the infant from sucking properly and which interferes with the emptying of the breasts. This failure to suck properly is as a rule due to some mismanagement on the part of the mother or some slight defect in the child, frequently some quite small point which can easily be remedied, if recognized before matters have gone too far. Inherent inability on the part of the mother to supply sufficient milk for her infant does undoubtedly exist, but it is by no means common and must never be diagnosed lightly. It may be convenient just to say that the mother cannot supply the milk and that there is an end to the matter, but such a defeatist policy will not get far.

One of the first difficulties which may arise is when the mother gets up and goes back to her household duties after her confinement. There is often a true decrease in the supply of milk at this time, but if properly managed, it should be only temporary. The situation should be explained to the mother; it must be pointed out to her that the decrease is only temporary and that it is no indication that she will not be able to go on with breast feeding; at the same time she should be told to get as much rest as possible. A good tonic will also often have a good psychological effect. If the supply is really very deficient it may be necessary to give a little complement after one or more feeds. This must be given with a spoon and not by means of a bottle, as the infant will learn to wait for the easily yielding bottle and refuse to suck at the breast.

Over-anxiety about the whole subject of breast feeding is a common cause of trouble and not infrequently leads in the end to failure of the supply of milk. The sequence of events is something like this: the mother is nervous about the whole question of breast feeding, which in itself tends to decrease the supply; she also handles her infant badly, and in doing so imparts her own nervousness to him. The baby often goes to the breast in a state of nervous unrest, he sucks in an irregular manner and swallows a great deal of air with the milk; this gives him very considerable discomfort, and he often gives up the whole thing in disgust. This is the type of case in which sedatives are of much value; from half to one grain of chloral given about twenty minutes before each breast feed has the effect of making the infant a little drowsy, and if he is put to the breast in this state he will often suck readily and easily. I have seen the amount of milk taken doubled in twenty-four hours by this method. Further, the fact that her child is sucking well and seems contented greatly reassures the mother.

At the other extreme there are the infants who are drowsy and appear to be almost too lazy to suck properly. This is common in the case of premature, weakly or diseased infants, and each case must be dealt with on its own merits. Apart from this, some infants are apparently simply lazy; these infants must not be allowed to sleep or dawdle at the breast; they require constant keeping up to their work.

The recurrence of the menses often leads to trouble; mothers are apt to consider this an absolute indication for weaning. It is quite true that the infant may, to a certain extent, be upset at this time, and there may be some decrease in the supply of milk; this, however, is only temporary, and is certainly no indication for weaning. All that is necessary is to reassure the mother and, perhaps, give her a good iron tonic.

Gross deformities in the infant, such as hare-lip and cleft

palate, may often render breast feeding extremely difficult, but in many of these cases the breast milk may be kept up for a period by expression.

Deformities of the breast, such as depressed nipples or retracted nipples, may make it impossible for the baby to suck at the breast; here again expression may be called in. In favourable circumstances expression may do much, but the difficulties are often great, and real enthusiasm is necessary to obtain success. Manual expression is, in my experience, always to be preferred to a breast pump. It is both more effective and as a rule more comfortable for the mother.

THE RECOGNITION OF FAILURE IN THE SUPPLY OF BREAST MILK

In the first place the gain in weight will be unsatisfactory, or there may be an actual loss of weight. Constipation will, as a rule, be present, but the possibility of the so-called inanition diarrhœa with the passage of frequent, small, dark green stools consisting almost entirely of pigment and mucus, must not be lost sight of. Vomiting due to swallowing air when sucking at the empty breast is quite common. The manner in which the infant sucks at the breast is often characteristic: he sucks vigorously for a short time and then gives up, finding that his efforts are not rewarded. Some babies will be fretful, crying after each feeding, but others will be quieter and more sleepy than normal. During the early stages of failure especially, the deficiency is often greater in the second half of the day and the infant may show that he is not satisfied only during the afternoon and evening.

Finally, there is the question of test feeding. By this is meant the weighing of the infant immediately before and immediately after he goes to the breast, each ounce gained in weight representing one ounce of milk taken. There is one point, however,

which must be borne in mind when calculating from the result of one or two test feeds in the day, namely, that the early morning feed is, as a rule, about one and a half times as great as other feeds. Test feeding is by no means essential, but it does give a good idea of the extent of the deficiency. Test feeding may be very much abused. For example, a mother may do test feeds herself and become most unnecessarily worried if her infant gets a little less than is theoretically required. The greatest value of a test feed is that it provides an opportunity of seeing the infant sucking at the breast and of detecting and correcting errors in the way in which the infant is managed.

THE MANAGEMENT OF FAILURE OR DEFICIENCY IN THE SUPPLY OF BREAST MILK

The first and most important point to be realized is that the great majority of the failures in breast feeding are preventable, and the second point is that many are remediable. The supply of breast milk can frequently be restored if proper measures are taken. As in everything else, it is of the greatest importance that treatment should be started early. If the infant can be got hold of before he has begun to realize how nice and easy it is to suck from a bottle, there is a much greater chance of success. It should be inculcated into the minds of all mothers that they should seek advice as soon as difficulties begin to arise, and not try experiments with a bottle first and seek advice later.

When it is decided that the infant is being under-fed at the breast, there are two things which have to be done: one is to restore breast feeding as far as possible, and the other is to see that in the meantime the infant does not suffer from lack of food. Firstly, the mother must be encouraged and the situation explained to her. The underlying principle is that the breasts should be stimulated by the sucking of the infant and

by being completely emptied, and, with this end in view, the infant must be made to suck to the best of his ability.

In trying to find out where the trouble lies it is often a great help if the baby can be watched while taking the breast. The way in which he is held may be wrong, he may be uncomfortable, or possibly he is being more or less smothered by a large and pendulous breast pressing on his face and interfering with his breathing and making him let go every time he wants to take a breath. Again, the mother may be uncomfortable. It is difficult for her to yield her milk properly if she is not comfortable herself. She should sit on a low chair with her foot on a footstool, the infant is held in the crook of her arm, and she leans slightly over him, the nipple falling easily into his mouth. The correction of any faults in technique which are found will often lead to a considerable increase in the amount of milk, in quite a short time. It cannot too often be stressed that the basic principle in maintaining the supply of milk is the complete emptying of the breast, and, if this is not done by the infant, it must be accomplished, after the feeding, by manual expression.

There are no true galactagogues suitable for clinical use, and substances such as malt and lactagol would appear to bring about their effect by suggestion. Massage and hot and cold sponging may have some slight effect, but here again it is probably largely psychological.

While everything possible is being done to increase the supply of milk, it must be realized that the infant is getting insufficient food for his needs, and this must be rectified at once.

The additional food which must be given must not, on any account, be given as a bottle in the place of one or more breast feeds. If this is done it means that the breast is not being sufficiently stimulated. The artificial food should, instead, be given immediately after the infant has been taken from the breast, and it should, if in any way possible, be given with a spoon and

not a bottle. If the infant finds that he can get milk from an easy artificial teat he is apt to give up sucking at the breast altogether.

The next question to be answered is how much complementary food should be given. If test feeds are being employed, a fairly accurate knowledge of how much the infant is going short is available, and the deficiency must be made up, but, as has already been indicated, test feeding is by no means essential, and a fairly correct guess can, as a rule, be made and the method of trial and error can be employed with a considerable measure of success. If the child is apparently not much short it will suffice to complement three or four feeds, and in many instances it will not be necessary to complement the first feed in the morning, as at this time he should get his best feed from the breast.

The composition of the artificial food is not of great moment, except that it should be as concentrated as possible in order to give as many calories as possible in a small bulk. It need hardly be added that any expressed breast milk should be used in complementing. If the infant is only a little short it may be possible to get over a difficult period by supplying a few additional calories in the form of cod-liver oil or cod-liver oil and malt; this has the advantage that neither the mother nor the infant thinks that it is having artificial food.

When it is not possible to restore breast feeding completely it is, in many cases, possible to continue part breast feeding for many months.

OVER-FEEDING AT THE BREAST

Over-feeding occurs most frequently during the first few weeks of breast feeding and may give rise to considerable discomfort in the infant. There is a tendency for the baby to gain weight very rapidly at first. As a rule he suffers from a good deal of

flatulence, cries a great deal, and passes frequent large green stools containing curds and mucus. There may be apparent hunger, as the infant likes going to the breast, for the warm milk temporarily relieves his colic. At this point many children are weaned under the misapprehension that the breast milk is not agreeing with them.

The remedy is not to feed more than five times in the twenty-four hours and to cut down the time at the breast if necessary. A small drink of water before the feed may have the effect of taking the edge off the child's appetite. In severe cases colic may be relieved by giving some protein powder, such as casec, before the breast.

The real danger in over-feeding is that the infant is apt to get a digestive upset and lose his appetite. Consequently, he fails to suck properly, the breast is not completely emptied, the supply of milk decreases, and the end result is not over-feeding but under-feeding, due to the failure of the supply from lack of proper stimulation.

CONCLUSION

There can be little doubt that many more children should be breast fed than are at the present time. There are many possible causes of failure, but the most important is undoubtedly faulty management. Some error in commission or omission in the advice given to the mother is, in the majority of cases, responsible.

I have lately had the opportunity of seeing the figures for the percentage of infants breast fed at two clinics drawing mothers from the same class, living under the same conditions. In one clinic approximately 20 per cent. only of the infants were breast fed, whereas at the other some 75 per cent. were breast fed. The inference would seem to be that there was some difference in the advice given to, and the management of, the mothers and infants at the two clinics.

CHAPTER XXII

ARTIFICIAL FEEDING OF INFANTS

By A. G. MAITLAND-JONES, M.D., F.R.C.P.

It is an unfortunate fact that many women are unable and a few are unwilling to feed their own infants. This being so, it is obvious that a knowledge of the principles of artificial feeding is important. In this article it is proposed to state these principles and explain how they may be applied, but first there are several observations to be made.

It should be realized at the outset that the artificial feeding of infants is not a subject of any great difficulty. I wish to emphasize this as many students and practitioners are convinced that infant feeding is a difficult subject and, because of this mistaken idea, are disinclined to give the subject the attention it deserves. Secondly, there appears to be an impression that there are as many methods of infant feeding as there are pædiatricians practising their profession; in other words, that each teacher has his own method of infant feeding. I do not believe this to be so, and I make the statement that in this country, broadly speaking, there are only two methods of infant feeding; one, the method by which milk is diluted with water, then cream and sugar are added in order that the resultant mixture may resemble human milk in its percentage composition: this is the "percentage method" of infant feeding. The second method, known by the somewhat cumbersome name of "milk dilution with the addition of carbohydrates," is one by

which milk is diluted and sugar added in certain proportions according to the weight of the infant, and no particular attention is paid to the subsequent percentage composition of the mixture.

Which is the better method? With regard to this I have a very definite opinion which is shared by the great majority of pædiatricians in this country and elsewhere that the second method, "milk dilution with the addition of carbohydrates," has definite advantages over the "percentage method." Briefly to set out these advantages: it may be stated that by this method of feeding, infants thrive as well as, if not better than, when fed on the percentage method; that this method is much more simple, which is a matter of great importance both from the point of view of teaching and of learning; lastly, there is no danger of setting up a fat dyspepsia, which does occur every now and again in infants fed by the "percentage method." It has been argued that by this second method of feeding, in which a relatively high amount of protein is given, the liver and kidneys may also be so taxed that damage may result; in answer to this I would say that, to my knowledge, there is no scientific evidence available to substantiate this claim in the slightest degree. Holding this view, I therefore propose only to set out the method of feeding by "milk dilution with the addition of carbohydrates."

GENERAL PRINCIPLES

The principles on which this method of feeding is based are six in number, and are as follows:—

(1) The infant requires $1\frac{1}{2}$ ounces of cows' milk in the twenty-four hours for each pound he weighs. This amount will satisfy his minimum protein requirement, his fat and his salt requirements.

(2) The infant requires between one-eighth and one-tenth of

an ounce of sugar in the twenty-four hours for each pound he weighs.

(3) The infant requires from 2 to 2½ ounces of fluid in the twenty-four hours for each pound he weighs.

(4) The caloric value of milk is approximately 20 per ounce.

(5) The caloric value of sugar is approximately 120 per ounce.

(6) The caloric needs of the infant vary between 45 calories and 50 calories in the twenty-four hours for each pound he weighs.

On the basis of these principles it is now possible to set out a diet for a normal infant weighing 10 lb. He will need in the twenty-four hours:—

MILK - - - -	$1\frac{1}{2} \times 10$	= 15 ounces
SUGAR - - - -	$\frac{1}{8} \times 10$	= $1\frac{1}{4}$ ounces
FLUID - - - -	$2\frac{1}{2} \times 10$	= 25 ounces

As, however, there are 15 ounces of fluid in the milk already given, the infant will therefore only require the addition of 10 ounces of water to make the total fluid intake up to the requisite 25 ounces. Therefore the amended diet will be:—

MILK - - - - - -	15 ounces
SUGAR - - - - - -	$1\frac{1}{4}$ ounces
WATER - - - - - -	10 ounces

If this diet is examined from the caloric standpoint as set out above, it will be seen that 300 calories are derived from milk and 150 calories are produced by the sugar, and as water, of course, has no caloric value, the total calories given are 450 in the twenty-four hours, which is 45 calories for each pound the infant weighs.

However, another diet can be constructed with a lower sugar content on the basis of one-tenth of an ounce of sugar for each pound the infant weighs. This would be:—

MILK	-	$1\frac{1}{2} \times 10 =$ 15 ounces,	giving 300 C.
SUGAR	-	$\frac{1}{10} \times 10 =$ 1 ounce,	giving 120 C.
WATER	-	10 ounces	

The total caloric value of this diet is 420, which does not cover the caloric needs of the infant. Obviously two alterations may be made in this diet. First, the sugar can be increased, as has already been done in the previous diet, or the sugar can remain constant and the milk be increased to cover the caloric requirements. Thus 2 ounces of milk can be added, and if this be done the water must be decreased by 2 ounces to bring the total fluid intake to 25 ounces, thus:—

MILK	17 ounces
SUGAR	1 ounce
WATER	8 ounces

The calories derived from this diet are 460, which is equal to 46 calories per pound.

I have set out two different diets, both adequate from a caloric point of view, one with a relatively high sugar, the other with a relatively high milk content. I do not think that either one of these two diets is better than the other, and so either can be used in the average infant with perfect safety. Should, however, there be any tendency to loose motions the diet with the low sugar content should be chosen. On the other hand the diet containing one-eighth of an ounce of sugar per pound has a practical advantage in that one-eighth of an ounce is a drachm, and a flat teaspoonful of sugar is roughly a drachm in weight, so that if the high-sugar diet is used it can be said that the infant requires $1\frac{1}{2}$ ounces of milk in the twenty-four hours per pound of body weight, one flat teaspoonful of sugar in the twenty-four hours per pound of body weight and that water should be added to such an amount that the infant is receiving $2\frac{1}{2}$ ounces of fluid in the twenty-four hours per pound of body weight.

Not all infants are able to take this amount of fluid in their

feeds. Should such be the case there is no objection to giving a more concentrated feed and water between feeds; in fact, the present tendency in infant feeding is to give more concentrated feeds. This method of feeding with liquid cows' milk is both cheap and satisfactory provided that the milk be boiled before use. It is always advisable to boil whatever milk is used, not only because such boiling makes the milk more safe but it also makes it more digestible. With regard to the sugar to be used, it is unnecessary with the normal infant to use any sugar but ordinary household sugar.

FEEDING WITH DRIED MILKS

Dried milks are now extensively used in infant feeding, and are of great value if their expense be discounted. For infant feeding there are three varieties of dried milk marketed by almost every firm which put out such products. These are:—

(1) Full-cream dried milks
(2) Half-cream dried milks
(3) Humanized dried milks

First, with regard to full-cream dried milks, the principles already set out for the feeding of cows' milk apply to full-cream dried milk if it be remembered that 1 drachm of full-cream dried milk is equal in composition and caloric value to 1 ounce of cows' milk, except that there is no water. It is, therefore, possible to amend the first principle set out above and say that 1½ drachms of dried milk, instead of 1½ ounces of wet milk, will satisfy the minimum protein requirements, the fat and salt requirements of the infant. In other words a 10 lb. infant needs in the twenty-four hours:—

DRIED MILK - - - - -	15 drachms
SUGAR - - - - - -	1¼ ounces
WATER - - - - - -	25 ounces

The caloric value of this diet will obviously be 450.

Half-cream dried milks from which a certain amount of the fat has been removed have a very definite place in infant feeding, because some infants are unable to digest the amount of fat contained in either ordinary cows' milk or in full-cream dried milk. Up to some few years ago all half-cream dried milks were simply full-cream dried milk with some of the fat removed and were marketed as such, but legislation has been introduced by which any such dried milks in which part of the fat has been removed and no sugar added must be sold in tins on which a special label is placed stating that such dried milks are unsuitable for infants unless they are given under medical supervision. As a consequence of this all firms with the exception of one have discontinued the production of such half-cream dried milks. Messrs. Cow and Gate, Limited, however, still continue to market such a dried milk under the designation of "Special Half-Cream Cow and Gate." In my opinion this half-cream dried milk is the most suitable brand of half-cream dried milk to use because no extra sugar has been added. The caloric value of this half-cream dried milk is 14 calories per drachm; all other half-cream dried milks have a caloric value of 20 calories per drachm owing to the extra sugar which has been added.

It is my practice to begin artificial feeding with this particular brand of dried milk and then when the infant is a month or six weeks old generally to change over to the ordinary full-cream dried milk; if there should be any difficulty in fat digestion then a change can be made to ordinary half-cream dried milk. Because of the low caloric content of this special half-cream dried milk, it is obvious that the infant will require more of it; it can be stated that the amount required will be from 2 to 2¼ drachms of this dried milk in the twenty-four hours for each pound the baby weighs. The sugar and fluid requirements of the infant are to be calculated as before. If

ordinary brands of half-cream dried milk are used the amount given is the same as that of full-cream dried milk, namely, $1\frac{1}{2}$ drachms per pound of baby in the twenty-four hours.

Humanized dried milks are often used and on the whole they are quite satisfactory. The practical point to remember about these milks is that no sugar need be added to them. The caloric value of these milks is 20 calories per drachm, and therefore the amount required can be easily calculated by dividing the infant's caloric requirements by 20. The figure so obtained is the amount of drachms of humanized dried milk required in the twenty-four hours; e.g. an 8 lb. infant requires about 400 calories in the twenty-four hours, therefore $400 \div 20 = 20$ drachms. The water requirement is, of course, $8 \times 2\frac{1}{2} = 20$ ounces, to which the humanized dried milk is to be added.

Manufacturers of dried milk enclose a scoop in the tins of milk, and such scoops when filled contain a drachm. All milk should be measured in these scoops and not in teaspoons.

LACTIC-ACID MILK

There is one other method of feeding which has to be mentioned because it is a simple and valuable method, namely, feeding with lactic-acid milk. To make this a pint of milk is taken and 1 ounce of sugar added. This milk-sugar mixture is then brought to the boil and allowed to cool. When cold 60 minims of British Pharmacopœia lactic acid (75 per cent.) is added drop by drop to the milk, which should be stirred all the time. The result is lactic-acid milk, which has a caloric value of 26 calories to the ounce. To feed with this mixture one divides the caloric needs of the infant by 26, and the result is the number of ounces of lactic-acid milk required in the twenty-four hours. With this method of feeding the theoretical fluid requirements of the infant are not quite covered and therefore it is advisable to offer water between feeds, in fact

in any method of feeding it is desirable, particularly in hot weather, to offer water between feeds as long as such water is not offered within the hour before the next feed is due. One other practical point should be mentioned: mothers, when they are being told how to make this lactic-acid milk mixture, should be warned that the milk will become curdled and sour; if they are not so warned they will return with the complaint that something must be amiss to produce this result in the milk.

VITAMINS

In addition to a supply of protein and fat, which has already been considered, the infant will also need the addition of certain vitamins to his diet. As far as is known at the moment the essential vitamins needed are A, D and C. In normal infants it is desirable to begin the administration of A and D during the second month of life. Both these vitamins are contained in cod-liver oil and this should be given in an initial dose of 5 minims twice daily, the dose being gradually increased so that when the infant is six months old he will receive 2 teaspoonfuls of cod-liver oil in the twenty-four hours. This amount of oil is now standardized to contain 3,600 international units of A and 510 international units of D; this amount of D is regarded as a protective dose against rickets. The oil should be given in a spoon before feeds. Occasionally an infant may be found to be unable to digest the oil; in such cases recourse should be had to one of the numerous proprietary preparations containing A and D. In general, however, it has been my experience that ordinary cod-liver oil is preferable to those concentrated preparations. Vitamin C, the antiscorbutic factor, should be given to all artificially fed infants. This vitamin is found in orange juice, the administration of which should be begun during the first month. The initial dose is 1 teaspoonful and the amount gradually increased so that at six months the infant

will receive half an ounce of orange juice in a day. This amount of juice, containing 7.5 mgm. of ascorbic acid, is generally regarded as the minimum protective dose against scurvy. If orange juice is not available the juice of tinned tomatoes may be given in double the amount.

EARLY DAYS AND LATER PERIODS

I have now set out the general lines on which infants may be fed; there are, however, two matters of detail to be mentioned. First, in the early days of life it is not desirable to give the infant his full food requirements. About half the theoretical amount is to be given. Secondly, weaning should be begun when the infant is either six months old or when he weighs about 15 lb.; before this age is reached the water should be gradually reduced so that at this time undiluted milk is being taken; the sugar can still be added to the milk in the necessary amount. It may be said that, in general, 6-ounce feeds of undiluted milk, with added sugar, are to be given at six months; if water is added the feed should not exceed 8 ounces.

CONCLUSIONS

It now only remains to offer some general observations on the principles already stated. First, it should be realized that infants differ. A certain few are thin, active, and cry a great deal; such infants will need more food than their theoretical requirements; again, there are others who are fat and placid; these, if given their theoretical requirements, will put on more weight than is desirable. To such infants more or less food will have to be given as the case may be; after all, the feed which is calculated is nothing more than what Hector Cameron has called "a sighting shot," but nevertheless this "sighting shot" will be found to be satisfactory for the great number of normal infants. Secondly and lastly, in the feeding of all infants there

are three important points to be observed; these are the food, the weight chart, and the general condition of the infant. As regards the food, are there the necessary amounts of carbohydrate, protein, and other ingredients present and is the caloric content adequate? As regards the weight chart, is there a satisfactory gain of about 5 ounces every week? As regards the infant, does he appear satisfied, is he of good colour, and are the muscles of good turgor? When the physician has estimated all these three points and is satisfied, then he is justified in saying that the infant is being adequately and properly fed.

CHAPTER XXIII

WEANING AND MIXED FEEDING

By A. G. WATKINS, M.D., B.Sc., M.R.C.P.

WEANING is one of the most important stages in the life of the infant. The baby is no longer directly dependent on his mother for his food, and weaning, marking the first separation of mother from child, is the dawn of infantile independence. Far too often is the baby weaned incorrectly, with resultant disturbances both in the mother and the child, immediate and remote.

The first problem is when to wean, and this has caused considerable difference of opinion. There are, however, certain rules to be followed, and the first of these, paradoxically, may be termed when *not* to wean.

WHEN NOT TO WEAN

During any acute temporary illness of the child.—During an attack of gastro-enteritis or a cold or any transient infection, it is better to postpone weaning until the child has regained his normal health, for by introducing an artificial feed things may be made worse.

During any temporary environmental change.—Weaning during holidays, moving house, or a voyage, should be avoided. A baby is responsive to his environment and the difficulties of weaning may well be increased if the change-over is made in surroundings, and with contacts, to which he is unaccustomed.

During hot weather.—Sustained hot weather in this country has become a rare event, and " summer diarrhœa " so much

less common, that this warning is not so important as it has been in the past. Nevertheless, babies may be upset by heat, cows' milk may not keep fresh, and with the infant's tendency to gastro-enteritis at these times weaning should be postponed until the weather becomes cooler.

WHEN TO WEAN

The Romans, having no substitute for breast milk, fed their children at the breast until two years old or later, and the custom arose that no child should be weaned until all the milk-teeth were cut, a belief that was somewhat shaken by the birth of a baby with teeth, one Marcus Curius Dentatus! However, weaning time in those days, and, indeed, until fairly recent times, was largely governed by the absence of a suitable substitute for breast milk, and the process of weaning was associated with many odd superstitions. Nowadays weaning begins much earlier, and the time now corresponds with the cutting of the first teeth. Many older textbooks and some teachers suggest starting to wean at nine months of age, but the modern view is that weaning and mixed feeding should begin during the seventh month and be completed by nine months of age. Age, however, is not the only criterion, and a weight of 15 to 16 lb. may be used as an index for the introduction of additional foods to breast milk.

Before going on to discuss the methods of weaning, it will be well to review certain difficulties and problems that may arise.

WEANING DIFFICULTIES

Difficulties in getting babies to take feeds.—The process of weaning implies not only a different food but also a different method of taking that food; the sucking reflex must be replaced by a process of drinking and swallowing, and later, chewing, which are essentially more voluntary in nature than

the natural sucking reflex with which the baby is born. In order that the change should be as complete as possible, no breast-fed baby should need or have a bottle, and the new foods should be given by cup and/or spoon. This change of method often leads to revolt on the part of the baby, so that milk is spat out, spilt or vomited or even refused, much to the distress of the mother, and creates a problem of infant management that requires firm handling. It is no good if the child refuses his feeds with a cup and spoon to give up the battle and resort once again to breast feeding in the belief that the child may starve. His resistance can often best be broken by an experienced nurse giving the feed with the mother absent, or even a father may well be asked for his help in such a quandary. A breast-fed baby who has been having orange juice with a cup and spoon should be able to take milk in the same way, so that this difficulty may be partially prevented by correct training during the early months of the breast-feeding period.

Difficulties in digesting artificial feeds.—This is frequently more apparent than real; that is to say, vomiting is often due to causes discussed above and seldom due to real inability to digest the artificial food. If there is real digestive difficulty then feeds should be given in smaller amounts, more dilute, and the whole process of weaning slowed up. The character of the stools will alter with the introduction of the new diet, and they will become more formed and coloured, and a mother should be told of this in order that she may not be alarmed at their change.

Teething.—A baby in his seventh month is often teething and irritable, and this must be distinguished and recognized from digestive disturbances and allowance made for it.

Irregular gain in weight.—A mother is often worried at weaning time because her baby is noticed not to be gaining weight as regularly as before. Irregular gain in weight about

this time is not unusual, especially if associated with teething, and a child of seven to eight months does not gain as much per week as in his earlier days.

METHODS OF WEANING

There is a golden rule in the weaning of babies and that is to *make all changes gradually;* the earlier weaning is started the longer the time available to be taken over it. The first artificial feed should be given by the mother—if a nurse is not available—in a quiet room without disturbance. The baby is best sat up in a chair or " buffer " and not held in the familiar position on the mother's lap. The feed, as stated, should be given by cup and spoon. There should be no attempt to force the child unduly, but resistance should be met with firm handling. All babies should be on four-hourly feeds before weaning is begun. There are two main ways of procedure. The first, Method A, is to replace slowly the breast feeds with a milk mixture and gradually introduce semi-solids. The second, Method B, is to give the baby small quantities of broth or cereal or egg and then the breast feeds before replacing them entirely. Either method may be useful to practitioners, and each is described in detail below, with each stage taking about a week before passing on to the next stage.

METHOD A.: Stage 1.—The first breast feed to be stopped is the 2 p.m., and in its place is given a milk mixture made up as follows: Cows' milk, 5 oz., water, 2 oz., sugar, 2 level teaspoonfuls. It must not be expected that the baby will necessarily take all this feed at the first attempt, and it may be advisable to continue at this stage for more than a week before proceeding to the next stage.

Stage 2.—Go back to the breast feed at 2 p.m. and give the milk mixture at 10 a.m. and 6 p.m. By thus alternating the feeds the discomfort of the mother's breasts is reduced.

Stage 3.—After a further week the baby may be taken off the breast during the day-time feeds and given the milk mixture, thus:

6 a.m. and 10 p.m., breast;
10 a.m., 2 p.m. and 6 p.m., milk mixture.

Stage 4.—In a week's time broth or vegetable purée or a lightly boiled egg may be given with the 2 p.m. feed, starting with 1 to 2 tablespoonfuls of the broth, or $\frac{1}{2}$ to 1 tablespoonful of the purée, or 2 to 3 teaspoonfuls of the egg, mainly yolk. These amounts may be increased according to the child's appetite, and the milk mixture given afterwards.

Stage 5.—Cereals are next introduced at 10 a.m. and 6 p.m. in 1 to 2 tablespoonful amounts at first. Thus, after approximately four to five weeks of weaning the child is having:

6 a.m. and 10 p.m., breast.
10 a.m. cereal, followed by milk.
2 p.m. broth or purée or egg, followed by milk.
6 p.m. cereal, followed by milk.

Stage 6.—The 10 p.m. feed may now be omitted altogether, but most mothers (and some fathers) prefer the 6 a.m. feed still to be given at the breast. A certain amount of discretion should be allowed about the time to stop the early morning feed, but in the meantime the amounts of cereal and broth may be increased, and the milk gradually increased to whole milk in strength. The character of the diet may now be increased by the addition of toast, butter, marmite, and milk puddings.

Stage 7.—The 6 a.m. breast feed may be replaced by a milk feed if desired, but many mothers prefer to continue breast-feeding at this time. When the child is nine to ten months old the feeding times should be altered to the following:—

On waking:	Orange juice. Rusk.
8 a.m.:	Toast with butter.
	Cereal.
	Milk.

12 noon:	Broth or egg or vegetable purée.
	Milk puddings, e.g. sago, ground rice, semolina.
4 p.m.:	Toast with butter, honey or marmite.
	Cereal.
	Milk.
6 p.m.:	Milk only.

METHOD B.: This method differs mainly from the previous one in that small amounts of cereal, egg, broth or vegetable purée are given along with the breast milk for a time until the breast feed is replaced. The advantages of this method are that it may be started early, e.g. during the sixth month at a weight of approximately 15 lb., and so relieve the mother of the need of a greater milk yield than she may be able to give. It also allows the introduction of additional foods at an early age. A disadvantage is that some babies have difficulty in taking these additions from a cup and spoon, which may therefore necessitate a bottle; this creates a second problem later, namely, the weaning of the child from the bottle as well as the breast.

Stage 1.—Before the 2 p.m. feed at the breast give 1 to 2 teaspoonfuls of broth, gradually increase the amount to 1 to 2 tablespoonfuls, or 1 to 2 teaspoonfuls of lightly boiled egg yolk.

Stage 2.—Before the 10 a.m. breast feed give ½ to 1 tablespoon of a cereal, increasing the amounts later; 2 p.m. feed as above.

Stage 3.

Before 10 a.m. feed, as above.
Before 2 p.m. feed, as above.
Before 6 p.m. feed, as for 10 a.m.

Each of the above stages should occupy a week.

The next procedure is to start replacing the breast feeds by a milk mixture. This is done in the same way as described under Method A, i.e. starting with the 2 p.m. feed first, then

the 10 a.m. and 6 p.m., and then the 10 a.m., 2 p.m. and 6 p.m. This brings Method B in line with Stage 5 of Method A, and from there the two procedures are similar.

MIXED FEEDING IN THE ARTIFICIALLY FED BABY

The process here follows closely that already described in Method B, with the introduction of cereals and broth as before and in similar amounts, before the artificial feeds are given. These, if possible, should be given by cup or spoon, especially as the milk is being taken by bottle. There are, however, two additional problems in the artificially fed baby; the first, the changing of the feed to cows' milk if this is not already being given, the second, the change from cup to spoon. The additional feeds therefore should be used as a means to break the bottle habit, and a dried-milk feed should be gradually replaced by the cows' milk mixture.

Stage 1.—Before the 2 p.m. bottle feed give broth, egg or vegetable purée.

Stage 2.—Before the 10 a.m. bottle feed give a cereal. Before the 2 p.m. bottle feed, as above.

Stage 3.—10 a.m. and 2 p.m., as above. Before the 6 p.m. bottle feed give a cereal.

Stage 4.—At 2 p.m. a cows' milk mixture should be given by cup and spoon in place of the bottle feed.

Stage 5.—The 10 a.m. and 2 p.m. milk feeds should be given by cup and spoon.

Stage 6.—The 10 a.m., 2 p.m. and 6 p.m. milk feeds should be given by cup and spoon.

Each stage should take approximately one week. If the baby has been having a dried milk, it should be replaced at about the rate of a feed per week by the milk mixture des-

cribed in Method A., and the strength of this mixture increased to whole milk in a short time. This replacement may take place *pari passu* with the change-over from bottle to cup, thus reaching:

Stage 7.—

6 a.m.:	Bottle feed of milk only.
10 a.m.:	Cereal followed by milk from a cup.
2 p.m.:	Broth or egg or purée followed by milk from a cup.
6 p.m.:	Cereal followed by milk from a cup.
10 p.m.:	Bottle feed of milk only.

The 10 p.m. feed may be omitted in due course, and the 6 a.m. feed given by cup. The amount of added mixed diet should be increased, and when the child is nine to ten months old the 6 a.m. feed may be stopped, and the times of feeding as given under Stage 7 in Method A adopted.

ADDITIONAL DIRECTIONS

Weaning and mixed feeding may now be said to be complete, and further additions to the diet are therefore not discussed here. The following important points, however, should be noted: (*a*) All milk, unless pasteurized, should be boiled for one minute before use. (*b*) Cod-liver oil should be given in a dose of two teaspoonfuls a day. (*c*) Orange juice should be continued throughout. (*d*) A rusk or baked toast may be given, if desired, before a feed.

Throughout the above discussion reference has been made in general terms to cereals, broth and purées, and these are now referred to in greater detail. The *cereals* should be varied from time to time, and a selection may be made from the following: Robinson's Groats, Robinson's Patent Barley, Midlothian Oat Food, Farex, and Cream of Rice. These are best cooked with water, and milk added afterwards. Farex and Midlothian Oat Food have the advantage of being ready-cooked and therefore need little preparation.

Broth is made by covering 1 lb. of broken-up veal bones with water to which a teaspoonful of vinegar has been added, and simmering for six hours. Vegetables may be added, simmered for a further hour and then strained off. The broth may be thickened with potato if desired.

Vegetable purées are prepared by sieving all vegetables after cooking; many excellent proprietary brands are now available and may be used with advantage.

TABLE 1.—METHOD A FOR BREAST-FED BABIES

1ST WEEK
At 2 p.m. replace breast feed with cows' milk mixture.

2ND WEEK
At 10 a.m. and 6 p.m. milk mixtures as above; 2 p.m. at breast.

3RD WEEK
At 10 a.m., 2 p.m. and 6 p.m. milk mixture.
At 6 a.m. and 10 p.m. breast.

4TH WEEK
6 a.m. breast.
10 a.m. milk mixture.
2 p.m. broth or purée or egg, followed by milk mixture.
6 p.m. milk mixture.
10 p.m. breast.

5TH WEEK
6 a.m. breast.
10 a.m. cereal followed by milk mixture.
2 p.m. as above.
6 p.m. cereal followed by milk mixture.
10 p.m. breast.

6TH WEEK
Omit 10 p.m. feed; gradually increase amounts of broth and cereal.

7TH WEEK
The 6 a.m. feed may now be omitted if desired, or replaced by a milk feed, and the baby completely weaned. At 9 to 10 months old the following feeding times may be adopted:

On waking:	Orange juice.
8 a.m.:	Cereal; toast and butter; milk.
12 noon:	Broth or egg or purée, followed by milk pudding.
4 p.m.:	Cereal; toast and butter; honey; marmite; milk.
6 p.m.:	Milk only.

All feeds other than the breast should be given by cup and/or spoon.

The milk mixture should be gradually increased until whole milk is taken at 7 to 8 months old.

TABLE 2.—Method B for Breast-fed babies

1st Week
Broth or egg before 2 p.m. breast feed.

2nd Week
Cereal before 10 a.m. breast feed.
Broth or egg before 2 p.m. breast feed.

3rd Week
Cereal before 10 a.m. and 6 p.m. breast feeds.
Broth or egg before 2 p.m. breast feed.

4th Week
Replace 2 p.m. breast feed with milk mixture.
Other feeds as above.

5th Week
Replace 10 a.m. and 6 p.m. breast feeds with milk mixture. Give 2 p.m. feed at breast. Additions before feeds as above.

6th Week
Replace 10 a.m., 2 p.m. and 6 p.m. breast feeds with milk mixture; cereals, broth, as above.

7th Week
Omit 10 p.m. breast feed. Gradually increase amounts of cereal and broth given.

8th Week or later
The 6 a.m. feed may now be omitted if desired, or replaced by a milk feed, and the baby completely weaned. At 9 to 10 months old feeding times similar to those given in table 1 may be adopted when desired.

All feeds other than the breast should be given by cup and/or spoon.

The milk mixture should be gradually increased until whole milk is taken at 7 to 8 months old.

TABLE 3.—Mixed Feeding in the Artificially fed

1st Week
Broth or egg before the 2 p.m. bottle feed.

2nd Week
Cereal before the 10 a.m. bottle feed.
2 p.m. feed as above.

3rd Week
Cereal before the 10 a.m. and 6 p.m. bottle feeds.
2 p.m. feed as above.

4th Week
Give 2 p.m. milk feed by cup and/or spoon.
Other feeds as above.

5th Week
Give 10 a.m. and 6 p.m. milk feeds by cup and/or spoon.
Other feeds as above.

6TH WEEK

Give 10 a.m., 2 p.m. and 6 p.m. milk feeds by cup and/or spoon. Other feeds as above.

7TH WEEK

Omit 10 p.m. feed. Gradually increase amounts of broth and cereal. given.

8TH WEEK OR LATER

The 6 a.m. bottle feed may now be omitted if desired, or replaced by a milk feed with cup and/or spoon. At 9 to 10 months old feeding times similar to those given in table 1 may be adopted when desired.

If a dried milk is being used it should be replaced, at the rate of about a feed per week, by the milk mixture as described under Method A.

The milk mixture should be gradually increased until whole milk is taken at 7 to 8 months old.

CHAPTER XXIV

SPECIAL DIETS IN CHILDHOOD

By W. W. PAYNE, M.B., B.S., M.R.C.P.

GENERAL OBSERVATIONS

IN constructing special diets it must be realized that there is interference with the free choice of both the nature and amount of food taken. It is important therefore to be certain that the necessary amounts of salts and vitamins are given. To ensure the correct amount of salts whenever possible an adequate amount of milk is given. With regard to vitamins, A and D are best given in a concentrated form. There are many commercial preparations suitable. Vitamin B can be given as marmite, which has no food value. In salt-free diets, however, it cannot be used, as it contains much salt. Vitamin C occurs in most diets in the daily fruit allowance.

In some of the diets the quantities are not specified, only the nature of the food, but in others the quantities are given and are an integral part of the diet and should be adhered to.

LOW-FAT DIETS

These are of value mainly in the treatment of catarrhal jaundice and other liver conditions, but sometimes are necessary in cases of recurrent vomiting. The diet is simpler than that in cœliac disease in that no restriction of carbohydrate is necessary. The following is a typical diet sheet: —

BREAKFAST : Skimmed milk. (Hand skimming is often sufficient.)
Bread. Sugar, syrups, honey, jam.

Cereals (oatmeal, cornflakes).
Fruit.
Tea or coffee.

DINNER : Soup (all fat to be removed from the stock, thickening with lentils, flour, or vegetables).
White fish, rabbit or chicken, tripe.
Potatoes, peas, beans, root vegetables, greens.
Milk puddings (skimmed milk).
Stewed fruit, jellies, egg white (whisked with sugar).

TEA : Bread, jam.
Tomatoes, marmite, green salads.
Tea with skimmed milk.
Fruit. Cakes containing no fat, e.g. angel cake, buns.

Boiled sweets, peppermint creams, etc., may be given.

Avoid: meat, fish other than white fish (e.g. salmon, herring, halibut), egg yolk.
Most biscuits and cakes.
Chocolate, toffee, fudge, marzipan.
Butter, cream, dripping, olive oil.
Suet puddings.

LOW-RESIDUE DIETS

These are mainly of use in colitis and gastro-enteritis when a non-irritating residue is desired. It is not necessary to give a detailed daily dietary, especially as in these cases the appetite is often capricious and no set diet could be adhered to:

Articles to Avoid:
Oatmeal, brown and wholemeal bread.
Fish with small bones.
Coarse meat, especially that with much fibrous or elastic tissue.
All nuts.
Peas, beans, green vegetables.
Fruits with skins or pips or coarse fibre.

Articles Allowed:
Milk, cream, butter, soft cheese, eggs.
White bread, rice, sago, potatoes, cornflakes.
Fish such as cod.
Rabbit or chicken, scraped meat or middle cuts.
Milk puddings, puddings made with white flour.
Syrups, jellies, jams without pips or skin.
Meat pastes, cakes without fruit.
Tea, coffee, cocoa, marmite, beef extract.

Several firms are now manufacturing homogenized or strained vegetables (i.e. Nestlé's, Libby's). These are suitable to give.

DIET IN CŒLIAC DISEASE

The dietetic treatment of cœliac disease cannot be made a matter of rule of thumb. The study of the individual must guide the construction of the diet. The principles of treatment can, however, be plainly expressed. Avoiding any consideration of the underlying cause, the aim of the treatment is to increase the tolerance of the intestines to the non-tolerated food-stuffs. In its most severe form there is intolerance to both fat and carbohydrate. The only food which can be utilized is protein and this must be the mainstay of the early diet. As soon as symptoms have subsided (frothy stools, abdominal discomfort, furred tongue) it is permissible to add articles to the diet which contain fat and carbohydrate. Authorities differ in regard to which is more deleterious to add, fat or carbohydrate, and it is here that the individual patient must be studied. Small additions to the diet are made every third day or so and the effect noted. Impatience at this or any other stage is unwise. It must be kept in mind that the successful treatment of cœliac disease is usually a matter of years and that a relapse is caused most often by too rapid an increase in the less-tolerated foods. Such a relapse must be treated by an immediate return to a more protein diet. The diet is then worked up again, but the initial steps may be carried out more rapidly. The following are typical diets at various stages:—

SEVERE PROTEIN DIET. STAGE I.

Protein milk (Finkelstein).
Dried skim milk + casec or other suitable form of milk protein. Five feeds of 8-10 ounces daily.

If this is not well taken it may be sweetened with saccharine, or fresh machine-skimmed milk with added casec used.

MODERATE PROTEIN DIET. STAGE II.

BREAKFAST: Skimmed milk with a little glucose added.
Steamed fish (white, e.g. cod, plaice, haddock).
Tea.

MID-MORNING: Marmite drink.
If liked, marmite in hot skimmed milk.

DINNER : Chicken or rabbit.
A little sieved greens.
Ripe banana.
Junket made from skimmed milk.

TEA : A small rusk with boiled white of egg or steamed fish or skimmed milk or curds from milk and a little glucose.
Tea.

SUPPER : Skimmed milk with a little glucose.

MIXED DIET. STAGE III.

BREAKFAST : Force with skimmed milk.
Fish.
Toast.
Syrup, jelly or jam.
Skimmed milk to drink.
(Tea if desired)

11 A.M. : Rusk and marmite or beef extract.

DINNER : Chicken or rabbit, stewed ; marmite gravy.
Potato (well-cooked).
Sieved greens.
Stewed fruit.
Well-boiled rice.

TEA : Rusks with honey.
Sponge-fingers.
Skimmed milk.

SUPPER : Tongue sandwich (no butter).
Milk pudding made with skimmed milk.

Skimmed milk can be (a) Machine skimmed.
(b) Heated to 200°F (stood in boiling water) 20 minutes, cooled 3 hours, remove cream.
(c) Dried skimmed milk.

Transition from diet to diet must be gradual and the effect on the stools noted. When the stage of starch addition has been reached it is useful to examine the stool for starch residues. This can be done by adding iodine solution to a little of the fæces. Sometimes there is sufficient excess for a visible change of colour (blue or purple) to occur ; examination by the microscope will reveal less marked deficiencies in absorption. The presence of excessive starch in the fæces suggests a reduction of the amount given. Much gaseous fermentation of the stool (frothiness) also indicates excessive carbohydrate residues. The

various forms of dextri-maltose appear to be the most easily handled carbohydrate, for which reason the ripe banana (soft and brown) is valuable as in ripening all the starch turns to dextri-maltose.

It is not so easy to detect excess of fat in the stool. The chemical analysis requires a properly equipped laboratory. Microscopic examination is often misleading, but the presence of excessive fatty acid crystals can be taken as definite evidence of excessive fat. Unfortunately absence of a visible excess of fatty acids is often found when chemical analysis shows a definite excess of fat in the stool. Obviously, excess of fat indicates a reduction in the fat in the diet.

DIET IN NEPHRITIS

Diet plays an important part in the treatment of nephritis in children. In acute inflammatory states (e.g. acute glomerulonephritis) it is necessary to rest the kidney as far as possible. The diet should therefore be designed so as to have no residue which must be excreted by the kidney. At the same time it is necessary to supply enough food to prevent the formation of ketone bodies which are highly toxic to the kidney and also to save the body from having to draw upon its protein reserves. The simplest way of doing this is to give a sufficient amount of carbohydrate to cover the basal metabolic needs. The average basal metabolic need at three years is 900 calories, rising by about 70 calories a year to 1,350 at ten years; as dextrose roughly supplies four calories per gramme it would thus be necessary to give 225 gm. (7½ oz.) rising to 340 gm. (11½ oz.) of dextrose a day. Concentrated urine entails work, therefore sufficient fluid should be supplied to yield a urine of specific gravity 1.008-1.010. Thus, some of the sugar can usefully be given with fruit juice, orange or lemon, and some water. This will also supply vitamin C and alkaline bases. The

remainder can be given as barley sugar. Once the acute stage is past and urine is being passed freely it appears to be of no great advantage to withhold proteins, even meat proteins, and as the next stage of treatment is usually somewhat lengthy, it is best to give a well-balanced normal diet such as would be given in the recovery stage of rheumatic fever. If, however, signs of renal deficiency are apparent, either œdema or nitrogen retention, then a modified diet is required. When œdema without nitrogen retention is present two ways of dietetic treatment are available—low-salt diet and high-protein diet, and if desired these may be combined.

LOW-SALT DIET.—A diet almost devoid of sodium is not easy to prepare, nor is it pleasant to take, but it is often worth the trouble. The following is a typical diet:

BREAKFAST: Fruit, creamed barley or puffed rice, porridge. (Avoid prepared cereals, as many contain added salt).
"Salt-free" bread (this must be specially made) or salt-free casein bread.
"Salt-free" butter.
Jam, honey, golden syrup.
Tea with salt-low milk (see p. 310).

DINNER: Low-salt meat (minced meat washed, boiled, washed again).
Potatoes, fried, baked, or boiled *without* salt.
Vegetables (*not* beetroot, carrot, celery, radish, spinach, or watercress).
Beans, peas, lentils.
Fruit with cream.
Milk dishes, made with low-salt milk.
Puddings made from flour, e.g. suet puddings—without the addition of salt.

TEA: "Salt-free" bread and butter.
Jam.
Cakes, shortbread, biscuits, made without addition of salt.
Tea with low-salt milk or cream.

SUPPER: "Salt-free" bread.
"Salt-free" butter.
"Salt-free" cream cheese.
Tea or coffee with low-salt milk or cream.

If extra protein is needed casein may be added to the flour in making bread or casec to the milk.

Avoid marmite, but invalid bovril is made without salt and may be used.

HIGH-PROTEIN DIETS can easily be constructed by reducing starchy food and increasing proteins. Extra meat, fish, eggs, and cheese is given. Beans and peas may replace potatoes and various brands of starch-low protein breads may be used in partial replacement of bread. The combination of a low-salt with a high-protein diet, however, is more difficult and such a diet is of limited scope.

HIGH-PROTEIN DIET. (About 100 gm. protein and 1,700 calories, suitable for a child of 5 to 7 years).

BREAKFAST: Milk 5 oz., cereal ½ oz.
Egg.
Bacon, well fried 2 oz.
Bread 1 oz.

DINNER: Meat 3 oz. (minced preferably) or fish 4 oz., boiled or fried.
Beans or peas, 2 oz.
Potatoes 2 oz.
Greens, small helping.
Junket, egg custard (5 oz. milk).
Fruit.

TEA: 2 eggs or ham 2 oz., fish 3 oz., sardines 2 oz.
$\left.\begin{array}{l}\text{Bread}\\ \text{Cake}\end{array}\right\}$ 2 oz.
Milk 5 oz.

SUPPER: Cheese 2 oz. or as tea proteins.
Bread 1-2 oz.
Milk 5 oz.
Butter as desired.

The protein may be increased by the addition of casec to the milk. There are also several proprietary brands of flours containing high protein contents, e.g. Callard's casoid bread, proferin, or energen. Greenstuffs, soups, gravy, fruit, tea, coffee, cocoa are given as desired.

If a salt-low diet as well is desired, bacon and ham must be omitted and salt-free cream cheese and fresh fish only used, extra eggs, meat and casein must be introduced, the bread and butter must be salt-low and if a severe salt-low diet is desired low-salt milk must be used.

LOW-PROTEIN DIETS are of use when there is urea retention. It is not advisable to reduce the protein to much below 30 gm. a day in an average child. Some protein is invariably being used by the body and must be replaced, and often there

is also some loss of protein in the urine. Furthermore, the treatment may have to be carried out for months or years and it is imperative that a diet adequate in all respects be given.

A typical low-protein diet for a child of five to eight years containing 40 gm. total protein (including 15 gm. vegetable protein in bread) is given below: —

BREAKFAST :	Cereal, milk 5 oz.
	Bread 2 oz.
	Butter ½ oz.
	Jam or honey.
DINNER :	Meat 1 oz. or fish (white) 1½ oz.
	Potatoes.
	Greens.
	Fruit.
	Milk 5 oz. (as custard, junket, or in milk puddings, cornflour, rice or sago moulds with syrup or jam).
TEA :	Bread 2 oz.
	Butter.
	Jam, honey, green stuffs.
	Milk 5 oz.
	Fruit.
SUPPER :	Bread 1 oz.
	Butter.
	Milk 5 oz.

Tea or coffee may be given, sweets are allowed and sugar should be added wherever possible, also fruit-juice drinks given. Soups, gravies, beef extracts must be omitted. The bread ration must not be exceeded. Extra starch foods may be given as rice, cornflour or sago. Peas, beans lentils, and mushrooms are not allowed but other green vegetables should be given in quantity.

KETOGENIC DIETS

Ketogenic diets may be used in two widely different conditions. The first is in epilepsy and some allied conditions, and the second is in pyuria. The technique of their use is somewhat different. Since the introduction of mandelic acid and prontosil and allied substances ketogenic diets are no longer used in combating infection in the urinary tract, but in the treatment of epilepsy they are of definite if limited value. It is

customary to denote the varying grades of diet in terms of the ratio :—

$$\frac{\text{Grammes ketogenic food}}{\text{Grammes anti-ketogenic food.}}$$

Carbohydrates are entirely anti-ketogenic. Proteins are partly ketogenic and partly anti-ketogenic, and the glycerin portion of fat is anti-ketogenic and the fatty acid ketogenic. The accurate calculation of the ratio is therefore complicated, but over the range of diets normally used the following formula gives values approximately correct: —

$$\text{Ketogenic ratio} = \frac{\text{Grammes fat}}{\text{Grammes carbohydrate} + \text{Grammes protein.}}$$

In the treatment of a case of epilepsy it is best to start with a 1 : 1 ratio and increase, if necessary, to a 2 : 1 or rarely to a 3 : 1 ratio. It is unreasonable to expect anyone to remain on a 3 : 1 diet for long, but it is quite possible to keep on a 1 : 1 diet indefinitely and a 2 : 1 diet can be maintained for several months. In practice if the diet is successful it is possible after a few months of complete or almost complete freedom from attacks to reduce the severity of the higher ratio diets and to approach the 1 : 1 diet, but this should be done gradually, as sudden addition of carbohydrate often causes a recurrence of fits. The diets must be adhered to closely. If more or less food is required, the alterations must not change the ratio. Certain articles of food which happen to have the same ratio as the diet are listed separately as "Special Extras," articles of no food value are found under "General Extras." The following three diets are suitable for children from seven to twelve years:

1 :1 RATIO. *Carbohydrates* 100 *gm. Protein* 55 *gm. Fat.* 155 *gm.*

BREAKFAST : Bacon 1 oz.
Egg.
Bread 1 oz.
Butter 1 oz.
Milk 2 oz.

* MID-MORNING :	Fruit 2 portions (see list).
	Thick cream 1 oz.
DINNER :	Meat 2 oz.
	Greens.
	Fruit 2 portions.
	Thick cream 1½ oz.
TEA :	Bread 1½ oz.
	Butter 1 oz.
	Milk 4 oz.
SUPPER :	Bread 1½ oz.
	Butter 1 oz.
	Cheese 1 oz.
	Milk 4 oz.
SPECIAL EXTRAS :	Peanuts.
	Ponos marzipan (Callard).

2 : 1 RATIO. *Carbohydrates* 40 *gm. Protein* 50 *gm. Fat* 180 *gm.*

BREAKFAST :	Bacon 2 oz.
	Egg 1 oz.
	Bread ½ oz.
	Cream ½ oz. (in tea).
* MID-MORNING :	Fruit 1 portion
	Cream 1 oz.
DINNER :	Meat (roast fat) 2 oz.
	Greens 6 oz.
	Butter ½ oz.
	Fruit 1 portion
	Cream 1 oz.
TEA :	Egg.
	Tomatoes, salads 6 oz.
	Butter 1 oz.
	Cream ½ oz.
	Bread ½ oz.
SUPPER :	Cheese 1 oz.
	Butter 1 oz.
	Tomatoes 4 oz.
	Bread ½ oz.
SPECIAL EXTRAS :	Barcelona nuts.
	Callard's Ponos raspberry noyau.
	Callard's Casoid chocolate cream.

3 : 1 RATIO. *Carbohydrates* 15 *gm. Protein* 50 *gm. Fat* 195 *gm.*

BREAKFAST :	Bacon 2 oz.
	Egg 1.
	Tomatoes 4 oz.
	Butter 1 oz.
	Cream ½ oz. (in tea).

* MID-MORNING :	Fruit 1 portion. Cream 1½ oz.
DINNER :	Meat (roast fat) 2 oz. Greens 6 oz. Butter 1 oz. Fruit 1 portion. Cream 1 oz.
TEA :	Egg. Salad and tomatoes 6 oz. Butter ¾ oz. Cream ½ oz. (in tea).
SUPPER :	Cheese 1 oz. Butter 1 oz. Tomatoes 4 oz.
SPECIAL EXTRAS :	Brazil nuts. Walnuts. Callard's Ponos cocoanut ice.

* In each diet this meal may be omitted without altering the ratio or it may be transferred to another meal.

Fruit portions (containing 5 gm. carbohydrate), e.g.

Apple 2¼ oz. raw, 3¾ stewed.
Orange 2¾ oz.
Grapes 1¾ oz.
Banana 1 oz.

Alternatives.

Instead of egg give cheese ¾ oz. or sardines ¾ oz., or ham ¾ oz.
Instead of meat (2 oz.) give white fish 3 oz. + ½ oz. butter.
Instead of butter 1 oz. give olive oil 1 fluid oz. (for salads) or Devonshire cream 1½ oz. or thick cream 2½ oz.
Instead of 1 oz. bread give 2½ ryvita or vita-weat biscuits or ¾ oz. water biscuits.

Extras of no food value.

Tea, coffee, marmite, beef extract.
Jellies made with gelatine, saccharine.
Rhubarb, mushrooms.
Properly made bran biscuits.
Callard's cellulon 00 biscuits and wafers.
Unsweetened lemon or lime juice may be used for flavouring in moderate amounts.

SPECIAL RECIPES

Albumin Milk. (Finkelstein.)

1 quart of milk is curdled with rennet. The curd is placed in muslin and the whey is removed as completely as possible. It is then broken up

and passed through a fine sieve and added to a mixture of 1 pint of buttermilk and 1 pint of water. 1 oz. of this contains roughly 1 gramme of protein, $\frac{3}{4}$ gramme of fat and $\frac{1}{2}$ gramme of lactose.

"Salt-Free" Milk. (McCance.)

Stock solution A.

Potassium hydroxide 5.6 per cent.

Stock solution B.

Potassium dihydrogen phosphate	6.1 gm.	made up to 1,000 c.cm.
Calcium lactate	12.4 gm.	
Magnesium sulphate $MgSO_4 7H_2O$	4.0 gm.	
Ferrous sulphate $FeSO_4 7H_2O$	0.2 gm.	

Ashless casein (Glaxo Laboratories).

Lactose.

Cream 50 per cent. (thick cream).

To make 500 c.cm. milk take 20 gm. casein and mix carefully in 430 c.cm. water and add 13 c.cm. of stock solution A. Heat to boiling point with constant stirring—this will dissolve the casein. Add 50 c.cm. of stock solution B and boil again. Cool. Add 25 gm. lactose and 2 oz. cream and mix well.

CHAPTER XXV

ALCOHOL IN DIETETICS

By CLIFFORD HOYLE, M.D., F.R.C.P.

THE medicinal use of alcohol dates from the dawn of therapeutics. The application of wine to wounds is mentioned in Homer and described by Hippocrates. Hikesios, founder of the medical school of Smyrna, advocated its internal use, and there are many references to this in both Greek and Roman writings. Subsequently it became an established practice, which grew with the passage of time, for alcohol to take a leading place among therapeutic measures. In the seventeenth and eighteenth centuries, along with blood-letting, it was one of the most prized of all remedies. Even in those days, however, there were dissenters; and when the pharmacology of alcohol came to be investigated intensively in the latter part of last century doubts began to grow. Such doubts, confirmed and reinforced by a much wider appreciation of its dangers, have led since then to a decline in the medicinal use of alcohol which has continued progressively to the present time.

The decline has, in fact, been remarkable (Weeks, 1936; J. D. Rolleston, 1929). Although this is attributable primarily to a better knowledge of the pharmacology of the drug it has to be admitted that there is still far less material for forming reliable opinions about its action in diseased as opposed to normal subjects, and there are points in its therapeutic action which are obscure. Leaving aside the external effects—cleans-

ing, cooling, irritating and hardening the skin, and as an antiseptic—concerning which there is general agreement, discussion has centred around its value as a food, as an aid to digestion, as a sedative and hypnotic, and as a circulatory stimulant.

ALCOHOL AS A FOOD

Alcohol is absorbed rapidly from the stomach and undergoes complete oxidation in the body without producing any harmful derivatives. It yields 7 calories per gramme, and takes the place of equivalent amounts of fat or carbohydrates in supplying energy; moreover, like fats or carbohydrates, it spares protein, but it cannot, like the common food-stuffs, become incorporated in the tissues of the body or be stored for future use. Unlike these also the rate of oxidation is fixed and apparently cannot be adjusted to meet varying needs. Approximately the equivalent of 10 c.cm. of absolute alcohol are metabolized per hour by an adult, and ten ounces of whisky taken during twenty-four hours supplies about 870 calories.

The advantages of alcohol as a food are that it requires no digestion, and that it is rapidly available as a source of energy without the intervention of any complicated metabolic changes. The disadvantages are the risk of engendering habit, and the immediate toxic effects when amounts necessary to provide more than a fraction of the energy requirements of the body are given. These two objections are so important that they are now generally held to preclude its use as a food except in a few conditions in which there are special indications.

The most important of these is chronic and incurable disease, particularly involving the alimentary canal, when the digestion or utilization of normal food-stuffs is difficult.

TABLE I.

DRINK	ETHYL ALCOHOL by volume per cent.	Approximate amount in ounces metabolized per hour by a 10-stone individual (= 0·1 gm. absol. alcohol per kgm. per hour)
Rum	70	¼
Brandy, Whisky, Gin, Liqueurs	40 to 50	½ to 1
Sherry, Madeira, Port	15 to 20	2
Claret, Burgundy, Champagne	10 to 15	2½
Bordeaux, Hock	9 to 10	4
Beer, Ale, Lager	3 to 6	8 to 9

TABLE. Showing the strengths of alcoholic drinks and the approximate amounts metabolized hourly.

The risk of habit is a consideration which rightly should be ignored for such invalids, and the mental relief which alcohol gives is an additional reason for using it in such circumstances. Another use of alcohol as a food is in old age when again the risk of habit is not a consideration of great weight.

The further use of alcohol as a food centres chiefly round its use in acute fevers, particularly pneumonia and typhoid. Hay (1927), some years ago, made comparative observations of two series of similar cases of pneumonia, one of which was treated without alcohol while the other received alcohol when the usual indications for its use arose. He came to the conclusion that alcohol, so far from giving any benefit, appeared to diminish materially the chance of recovery. Koplik (1917)

made similar observations on children with pneumonia. J. D. Rolleston (1929, 1932) has shown that discontinuing the use of alcohol at a large fever hospital has not apparently affected the case mortality from the major infectious diseases. It is true that the former belief that alcohol adversely affects resistance to infection is not borne out by the facts at present available: Langmead and Hunt (1932) concluded recently that neither experimental nor clinical study had shown decisively that therapeutic amounts have any direct action upon the bodily processes concerned in resistance to infection; but although such a conclusion is favourable to the use of alcohol in fevers it is almost always possible to do without it by a combination of coaxing, cooking, and carbohydrate.

ALCOHOL AS AN AID TO DIGESTION

Local irritation is well marked when alcohol is taken internally. It leads to a reflex increase in the secretion of saliva and gastric juice, the latter lasting as long as two hours, and also to more rapid emptying of the stomach provided that the concentration present is less than 20 per cent. (Kast, 1906). Even these dilutions yield a gastric juice deficient in pepsin. Stronger concentrations, or large amounts, result in a short period of secretion with the appearance of much mucus, achlorhydria, and a delay in the digestion of food—effects which are thus most commonly the result of taking spirits when the stomach is empty, and lead eventually to chronic gastritis, as in cocktail drinkers (Dixon, 1929). Even allowing for the dilution of spirits which results from mixture with the resting gastric juice when these are taken before meals, their effect is entirely harmful and there is no evidence to show that the addition of bitters, as in many aperitifs, overcomes the deleterious actions of strong spirits in these circumstances.

There is, however, another aspect of the effects of alcohol upon digestion. After absorption the sedative effect upon

the nervous system promotes appetite by abolishing psychical inhibitions which interfere with it. When such inhibitions are much in evidence alcohol leads to a considerable augmentation of the psychical secretion of gastric juice. There is thus good reason to believe that the beneficial effects of alcohol in patients are limited to those with a deficient secretion of gastric juice, and even then only when strictly moderate amounts are given in dilution. Used in this way alcohol increases a jaded appetite and favourably influences a flagging digestion. During the course of long and debilitating illnesses and sometimes in convalescence this effect often serves a useful purpose in helping to maintain nutrition. A light sherry before meals, or a still white wine, are preferable, though ale, beer, lager, or draught cider may be allowed if preferred. When food is distasteful because of persistent nausea, iced champagne is sometimes effective in bringing relief. The atonic dyspepsia of elderly patients is suited better by wines than by the more dilute lagers or beers which are too bulky. Port and most other red wines should be avoided by dyspeptic subjects on account of the astringent tannins which they contain.

Alcohol has a potent action as a carminative and taken after meals it relaxes the cardiac sphincter of the stomach. Its value in atonic dyspepsia is partly attributable to this. This action finds a useful service also in the distressing acute flatulent distension of the stomach that sometimes complicates such serious conditions as coronary thrombosis or pneumonia in subjects prone to air swallowing. Here the most effective form of alcohol is a good brandy or liqueur.

The use of alcohol for its gastric effects, as for others, is conditioned by the risk of inducing a habit, a risk which is determined much more by character and heredity than by anything else. The chief danger is when alcohol is used

during convalescence from an illness with an important psychoneurotic component. For such patients the prescription of alcohol in any form may well be tantamount to an invitation to addiction.

ALCOHOL AS A SEDATIVE AND HYPNOTIC

The effects of alcohol upon the central nervous system are entirely depressant. They show in successive stages the features of a progressive inhibition of cerebral and later of mid-brain and cerebellar control of elementary functions. Psychical changes thus appear first, with judgement and attention affected at the outset. Used moderately alcohol thus produces a mildly uncritical euphoria. This is the reason why it relieves anxiety and depression, and also insomnia due to worry, apprehension, or discomfort. These conditions are so rarely absent in serious or prolonged illnesses that a judicious use may at times do more to assist comfort and rest and support morale than any other influence except the personalities of those attending the patient.

In the care of the aged and of those with incurable diseases this use of alcohol is often especially important. It should, of course, never be given unless the effects are seen to be beneficial. Some temperaments are unsuited, reacting by depression or wakefulness ; in others it may lead to dyspepsia, or accentuate the symptoms of disease already present ; but apart from such exceptions there is a wide and useful field for its legitimate use. " If it be the purpose to make of old age a time of regrets, of penitence, discomfort and privation then alcohol is not indicated except as a drug. If it be desirable to add to old age, pleasure, geniality, conviviality, pleasant sensations of whatever character, then the aged should have alcohol. It often adds much real pleasure to a period of life too naturally filled with regrets and sad memories " (Brooks, 1932).

The sedative effect of alcohol makes it a useful hypnotic in delirium and in acute illnesses. A glass of hot toddy or whisky and lemon with a little food at bed time often secures a good night's sleep. Alcohol also facilitates the absorption of other hypnotics, and if necessary soluble barbitone or one of its allies can be added. This is especially valuable if alcohol alone leads to preliminary excitement.

ALCOHOL AS A CIRCULATORY STIMULANT

The actions of alcohol upon the circulation depend upon two distinct mechanisms which produce quite different effects, none of which is sufficiently pronounced to have much therapeutic importance. The immediate effects are due entirely to reflex stimulation of medullary centres from the mouth, œsophagus, and stomach; there is a slight rise in pulse rate and sometimes a slight rise in blood pressure also. The effect is quite transient, is seen almost exclusively when strong solutions, such as spirits, are used, and is modified greatly by the emotional state at the time. These trivial effects are the only ones providing any pharmacological basis for the reputation of alcohol as a circulatory stimulant. It is difficult to believe that they are ever sufficiently pronounced to be of real use, even in simple vasomotor or postural faints.

After absorption the effect of alcohol upon the circulation is entirely different, though still unimportant, except in poisoning. The cutaneous arterioles dilate owing to depression of the heat-regulating centre; the same action is seen with most drugs which depress the central nervous system. It leads to some redistribution of blood and to loss of fluid; this may be used for diaphoretic ends in high fevers, though it is far less than that produced by warm sponging. Unless more than

therapeutic amounts of alcohol are used there is no corresponding fall in blood pressure (Cabot, 1903; Cook and Briggs, 1903; Lieb, 1915), the vasomotor centre remaining active and compensating by producing the necessary constriction of splanchnic arterioles. With doses toxic in other ways vasodilatation becomes universal and the blood pressure drops steeply owing to depression of the vasomotor centre and to paresis of the arteriolar musculature. Alcohol in moderate doses, up to 30 c.c.m., does not alter cardiac output or pulse rate (Grollman, 1930); even larger amounts only raise the pulse rate slightly and do not affect the output of the heart.

It is thus evident that neither the immediate nor the later actions of alcohol in health give any grounds for believing that it is likely to be an effective circulatory stimulant in patients. There is now plenty of support for this view in accumulated observations. Cabot (1903), for instance, found it without effect upon either pulse rate or blood pressure in typhoid fever. Years ago, Janeway (1907) remarked that "least of all so-called stimulants does alcohol deserve the name." The vascular effects of the drug have in fact practically no application in treatment; the immediate reflex effect is so slight and transient as to be of dubious value even in simple faints, and the cutaneous vasodilatation after absorption is useless except for diaphoretic purposes, for restoring the superficial circulation after exposure to severe cold, and perhaps in such vasospastic conditions as Raynaud's disease. The former reputation of alcohol in the management of acute fevers, high blood-pressure and congestive heart failure was not due to its effects on the heart or circulation at all, though in the past these took the lion's share of the credit. It was due rather to those sedative properties for the nervous system already discussed, and perhaps at times to the carminative action.

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CHAPTER XXVI

DIET IN CONVALESCENCE

BY M. MITMAN, M.D., M.R.C.P., D.P.H.
AND
B. M. SHARP

DIETS prescribed in convalescence have two particular aims:—(i) to constitute a *transition* from the special diet necessary for the disease to the ordinary diet of the patient; (ii) to *restore* the tissue losses sustained during the illness. To arrange the transition efficiently, the practitioner requires knowledge of the patient's *dietetic history:* how many meals are ordinarily taken in the day; the size of breakfast; whether the chief meal is taken midday or at night; how many meals contain meat; whether sweets or savouries are preferred; and which articles of diet the patient avoids, either because they are unsuitable or distasteful. The second objective demands a liberal proportion of tissue-building food of a caloric value above the body's immediate requirements. Success is best gauged by weighing the patient weekly.

GENERAL PRINCIPLES

The following general principles and instructions will serve to guide the practitioner:—

1. *Appetite.*—Stimulation by acid fruit-juices, hors d'œuvres, bitters, aperitifs, condiments, spiced foods, soups, and by variety in the diet.

2. *Diet.*—(*a*) A generous, balanced and varied diet rich in body-building proteins, vitamins (especially D) and mineral

salts, particularly iron and calcium; of high caloric value; and producing considerable roughage, but excluding articles contra-indicated by the nature of the disease. (*b*) Gradual transition from relatively light, easily digested meals taken at frequent intervals to heavier ones at longer intervals. (*c*) Return to the patient's normal dietary unless the nature of the disease demands some permanent modification in his dietetic habits.

3. *General conduct* to assist digestion and aid convalescence:—(*a*) Meals to be taken quietly and happily, avoiding worry at all times. (*b*) No excesses of tobacco or alcohol. (*c*) Rest before and after meals. (*d*) Fresh air and moderate exercise between meals. (*e*) Early to bed.

ARTICLES OF DIET

Although the diet must be properly balanced, it is essential to include generous amounts of first-class proteins, vitamins

TABLE I

Article of diet	Daily quantity	Chief constituents for which prescribed				
		Protein	Fat	Carbo-hydrate	Salts	Vita-mins
A. Animal Products.						
1. Milk	1–2 pints	+	+	+	+	+
2. Eggs	1	+	+		+	+
3. Butter	1½ oz.		+			+
4. Flesh foods (fish, poultry, meat or substitutes).*	Average portion 2–6 oz.	+			+	
B. Vegetable Products.						
1. Green vegetables—cooked or as salad.	Average portion 4 oz.			+	+	+
2. Fresh fruit (dessert)†	1 piece			+		+
3. Sugar	Up to 2 oz.			+		
4. Bread, or other cereal	4–8 oz.			+		
5. Potatoes, or other roots and tubers	4 oz.			+		
C. Beverages.						

* Chief substitutes for flesh foods are extra eggs, cheese, and vegetable proteins, e.g. legumes; the last should be supplemented by extra milk.

† Tinned, dried or stewed fruits must not replace, but may be additional to, raw fruits.

and mineral salts. This preponderance of body-building and protective foods is most readily secured by the prescription of liberal quantities of fresh dairy produce, fresh fruit and green vegetables. The daily caloric value of the diet for an adult should vary between 2,000 and 4,000, depending upon the stage of convalescence and the appetite of the patient. The latter figure is well above the normal energy-requirements of most healthy people, but is desirable when attempting to make up loss of weight. Table 1 provides a list of articles which should be included in the daily dietary, the quantities to be given, and the constituents for which the articles are chiefly prescribed.

These stable articles must be varied as much as possible to avoid monotony and stimulate appetite. Variations in the type of food and in the method of cooking are listed below:—

Varieties of Articles of Diet	Methods of Cooking
MILK - - - - - - -	Hot, cold, in puddings and beverages.
Milk modifications—milk shakes, malted milk, ovaltine.	
CREAM - - - - - - -	Added to beverages, soups, cereals, fruit.
Whipped, clotted; ice-cream.	
CHEESES - - - - - -	Cheese dishes; also added to green salads and soups (e.g. minestrone).
Cheddar, Cheshire, Dutch, cream, lactic, Gorgonzola, Stilton, Camembert.	
BUTTER	
EGGS - - - - - - -	Boiled, poached, scrambled, fried; egg dishes; omelettes.
FISH	
(In season) herring, mackerel, haddock, cod, whiting, flounders, halibut, plaice, dabs, eels, brill, trout, salmon.	Boiled, steamed, baked, grilled, fried; fish dishes.
Kippers, bloaters, sardines, smoked haddock and herring, other dried and tinned fish.	Grilled; in potted paste.
Shell-fish: crab, lobster, oysters, mussels, winkles, shrimps.	*Au naturel;* mayonnaise; in soup, paste.
Roes	

Varieties of Articles of Diet	Methods of Cooking
POULTRY	Boiled, roasted, fried; cold; in potted paste.
RABBIT	Stewed; rabbit pie.
LAMB and MUTTON	
Shoulder, leg, loin, chop	Boiled, roasted, stewed, grilled, cold.
VEAL	Roasted; in pies; fricassee; stewed.
BEEF	
Sirloin, ribs, brisket, steaks	Boiled, roasted, stewed, grilled, cold.
Pressed, corned	Cold.
PORK	Boiled, roasted; in pies; cold.
Pickled and salted	
Ham	Cold or fried; in pies and potted paste.
Bacon	Grilled.
ORGANS	
Liver	Fried, stewed, minced, soups and extracts.
Heart and kidneys	Fried, stewed; in pies.
Sweetbreads	
Brains	
MEAT MODIFICATIONS	
Mincemeat, sausages, brawn.	
GREEN VEGETABLES	Raw (as salads) or cooked.
Cabbage, brussels sprouts, kail, spinach, green beans, cauliflower, asparagus.	Boiled or steamed.
Celery, cucumber, lettuce, tomatoes, endives, watercress.	Raw.
LEGUMES	
Peas, beans, lentils	Boiled.
ROOTS and TUBERS	
Potatoes	Boiled, mashed, baked, sauté, fried.
Carrots, parsnips, swede turnips, onions, beet.	Boiled.
FRUITS	Raw; stewed, juices, salads.
Apples, oranges, lemons, pears, bananas, plums, cherries, grapes, strawberries, rhubarb.	
Tinned and dried fruits.	

Varieties of Articles of Diet	Methods of Cooking
NUTS - - - - - -	May be chopped and added to cake and green salads, or as garnish.
SUGARS	
Sweets, jams, syrups, marmalade, honey, lemon curd.	
CEREALS	
Bread—white, brown, wholemeal, currant; rolls.	Plain or toasted.
Cakes, buns, biscuits	
Proprietary breakfast cereals - -	Heated or unheated.
Rice, sago, oatmeal - - -	Boiled or baked.
Vermicelli, spaghetti, macaroni -	Boiled or baked (*au gratin*).
BEVERAGES	
Mineral waters, e.g. Vichy.	
Aerated waters.	
Tea, coffee, cocoa.	
Fruit juices.	
Soups.	

SPECIAL CONSIDERATIONS

Convalescent diets for individual diseases cannot be given here and the reader is referred to the special articles in this series on the various diseases. There are, however, certain clinical manifestations common to convalescents from many diseases, which are worthy of special dietetic consideration in this article. For loss of weight and malnutrition the high caloric, high-protein diet, rich in vitamins and salt, described above, is indicated. If, however, the patient is obese, a low caloric diet with ample roughage, liberal vitamins and fruits, and low starches and fats is more suitable. When anæmia is a prominent feature first consideration should be given to those articles of diet rich in iron, such as egg yolk, spinach, green vegetable salads, lentils, peas, beans, carrots, prunes, grapes, raisins, dates, nuts, oysters, whole-grain cereals, and meats. Liver should also be included, although it is of less value in the secondary anæmias of convalescence than in certain

primary anæmias. Atonic constipation, a common symptom, requires foods which are slightly laxative, supply roughage, and contain vitamin B, e.g. figs, apples, rhubarb, bran and wholemeal bread, green vegetables, tomatoes; half a pint of hot water on rising is beneficial. Alternatively, if the patient has suffered from some gastro-intestinal disorder stimulants of intestinal secretion and peristalsis should be avoided; the diet should be bland, easily digested and assimilated and leaving little residue. Red meats and the type of cooking which causes difficulty of digestion, e.g. frying, should be avoided.

MEALS AND MENUS

Gradation in the size and digestibility of meals is exemplified in constructing breakfast menus. Thus, articles in course I can be included in every breakfast. Those in course II can be added without making the breakfast heavy. If the patient normally takes a light breakfast, it is unnecessary to proceed beyond this stage. When heavier breakfasts are the rule, articles in course III and/or course IV may be added.

Course I.	Fruit juice (orange, grape-fruit, tomato). Rolls or toast or bread or biscuits. Butter. Preserves or honey or marmalade (orange, lemon, ginger). Tea or coffee or cocoa or malted milk.
Course II.	Fruit, fresh or stewed. Porridge or cereal food. Egg. Cream (with cereals, fruit or beverages).
Course III.	Fish or roes.
Course IV.	Bacon or ham or liver or kidneys or sausages. Mushrooms or fried tomatoes.

The menus given in table 2 will serve as a guide to the lighter type of meals, suitable in early convalescence. Later, as the heavier articles are incorporated in meals, the mid-morning lunch and the late supper can be omitted.

TABLE 2.

Two weeks' rota of progressive menus for convalescent patients.

	Breakfast			Mid-morning lunch	Midday Meal				After-noon tea	Evening Meal				Late supper	
	1st course	2nd course	3rd course		1st course	2nd course	Vege-tables	3rd course		1st course	2nd course	Vege-tables	3rd course		
Sunday -	Corn-flakes and milk. Bread or toast and butter.		Grape-fruit. Marma-lade.	½ pint milk. Plain biscuits and butter.	Boiled chicken with parsley sauce.		Green vegetable. Boiled potatoes.	Milk pudding.	Bread and butter. Jam.	Poached egg on toast.		Green salad.	Baked apple and cream.	Malted milk.	Biscuits.
Monday -	Bread or toast and butter.	Finnan haddock.	Honey.	Glass of orange juice. Digestive biscuits.	Lamb cutlet.		Tomatoes. Mashed potatoes.	Junket and cream.	Bread and butter. Green salad. Toasted scone and butter.	Stewed sweet-bread.		Boiled onions. Boiled potatoes.	Stewed fruit. Egg custard.	Benger's.	Biscuits.
Tuesday -	Rice krispies and milk. Bread or toast and butter.		Stewed prunes. Marma-lade.	½ pint milk. Water biscuits and butter.	Mixed vegetable soup.	Fish custard.	Purée of carrots. Boiled potatoes.	Steamed canary pudding.	Bread and butter. Marmite. Cake.	Scrambled egg on toast.		Seakale. Creamed potatoes.	Milk pudding.	Horlick's.	Biscuits
Wednesday -	Bread or toast and butter.	Grilled bacon and tomatoes.	Honey.	Glass of grape-fruit juice. Cheese biscuits.	Stewed tripe.		Leeks. Mashed potatoes.	Ice-cream and sponge fingers.	Bread and butter. Green salad. Lemon curd.	Clear soup.	Poached egg on spinach.		Bread and butter pudding.	Oatmeal gruel.	
Thursday -	Shredded wheat and milk.	Boiled egg.	Raw dessert fruit. Marma-lade.	½ pint milk Biscuits and butter.	Grilled calves' liver with bacon.		Mashed swedes. Boiled potatoes.	Milk pudding with egg.	Bread and butter. Scone and butter. Jam.	Tomato soup.	Cream cheese. Green salad and biscuits.		Queen of puddings with cream.	Cocoa (all milk).	Plain cake.
Friday -	Bread or toast and butter.	Scrambled egg on toast.	Grape-fruit. Honey.	Glass of orange juice. Biscuits.	Grilled cod steak.		Mashed potatoes. Green peas.	Chocolate blanc-mange with cream.	Bread and butter. Cake.	Onion soup.	Cheese soufflé.		Apple fritters.	Hot milk.	Biscuits.
Saturday -	Oatmeal porridge and milk. Bread or toast and butter.	Cold ham.	Marma-lade.	½ pint milk. Biscuits and butter.	Stewed veal with rice.		Grilled tomatoes. Boiled potatoes.	Fruit salad and egg custard.	Bread and butter. Hot scone.	Fish cakes.		Stewed celery.	Raw dessert fruit.	Cream soup.	Biscuits.

TABLE 2.—*continued.*

	Breakfast			Mid-morning lunch	Midday Meal				After-noon tea	Evening Meal				Late supper	
	1st course	2nd course	3rd course		1st course	2nd course	Vege-tables	3rd course		1st course	2nd course	Vege-tables	3rd course		
Sunday -	Post toasties and milk. Bread or toast and butter.	Grilled bacon and fried egg.	Honey.	Glass of grape-fruit juice. Plain biscuits and butter.	Roast beef.		Green vege-tables. Roast potatoes.	French pan-cakes.	Bread and butter. Cake. Lemon curd.	Arti-choke soup.	Egg salad with grated cheese.		Fruit jelly with cream.	Hot milk.	Cake.
Monday -	Corn-flakes and milk. Bread or toast and butter.	Poached egg on toast.	Marma-lade.	½ pint milk. Oatcakes and butter.	Stewed rabbit with onions and bacon.		Green vegetable. Boiled potatoes.	Figs and cream.	Bread and butter. Marmite Jam	Soused herrings.		Green salad. Potatoes baked in their skins.	Apple snow.	Bourn-vita.	Biscuits.
Tuesday -	Bread or toast and butter.	Grilled bacon and tomatoes.	Raw dessert fruit.	Glass orange juice. Biscuits.	Roast chicken with bread sauce.		Green vegetable Boiled potatoes	Caramel custard.	Buttered toast. Sponge cake.	Stewed kidneys on toast.		Raw endive salad.	Madeira pudding.	Egg nog.	Biscuits.
Wednesday -	Rice krispies and milk.	Boiled egg.	Honey.	Glass of orange juice. Sponge cake.	Fish mayon-naise.			Apple tart and cream.	Bread and butter. Marmite. Cake.	Mixed vegetable soup with added milk.	Cream cheese, tomatoes and plain biscuits.		Apple char-lotte.	Hot milk.	Biscuits.
Thursday -	Pork sausages. Bread or toast and butter.		Marma-lade.	½ pint milk. Biscuits.	Roast mutton.		Boiled onions. Boiled potatoes.	Syrup sponge.	Cress sand-wiches. Scone and butter.	Detail soup.	Pressed beef.	Potato salad.	Stewed pears and cream.	Benger's.	
Friday -	Corn-flakes with stewed fruit.	Kipper or herring.	Marma-lade.	Glass of grape-fruit juice. Biscuits.	Grilled cod steak.		Tomatoes. Boiled potatoes.	Pan-cakes and lemon.	Buttered toast. Jam. Cake.	Egg on chips.		Lettuce.	Orange salad.	Bread and milk added cream.	
Saturday -	Stewed figs.	Buttered eggs.	Honey.	½ pint milk. Oat-cakes and butter.	Steak and kidney pudding.		Green vegetable. Mashed potatoes.	Honey-comb mould.	Bread and butter. Jam. Cake.	Spaghetti cheese.			Lemon sponge.	Hot milk.	Sponge cake.

Note.—Alternative dishes for the evening meal—sardines or brains or roes on toast; curried eggs; cauliflower or eggs *au gratin*; fricassee of eggs or chicken.

CHAPTER XXVII

DIET IN WINTER AND SUMMER

By V. H. MOTTRAM, M.A.

ONE of the outstanding prejudices of people, at any rate people in the British Isles, is that food in cold weather should be markedly different from that in hot weather, both as to quantity and quality. More and heavier food is recommended in cold weather; less and lighter food in summer. In winter thoughts turn naturally to hot buttered crumpets and grilled pork chops and in summer they dally with the idea of fruits and salads and long iced drinks. Abroad, to judge from residence in South Germany and in Louisiana, U.S.A., this tendency is not so marked. Has this British prejudice any physiological and biochemical basis?

The answer is that so long as the cold or heat is not upsetting the physiological mechanism there is no reason, physiological or biochemical, why the diet should be markedly different in winter and summer—that is to say: the protein, calorie, and mineral or inorganic needs of the body do not vary much with the weather, as later paragraphs will endeavour to prove, though a case can be made out for increasing the vitamins in winter. On the other hand, this does not mean that the culinary nature of the diet should not alter with the seasons. In fact it should, if the eater so desires it, for there is abundant evidence given by Carlson, Hawke, Barclay and others that likes and dislikes alter the secretory powers and motility of the gastro-intestinal tract. The suggestion will be made that "instinctive" reactions to food in different seasons

are conditioned more by psychological than physiological make-up.

The functions of food are threefold:—

(i) It builds the body and it compensates for wear and tear.

(ii) It provides the body with energy, either to be used in producing work (muscular, chemical, or secretory) or in producing heat.

(iii) It supplies sundry hormones and chemical regulators (vitamins) pre-manufactured, which the body cannot manufacture for itself.

It is proposed to take each in turn and discuss whether external heat or cold will alter consumption or need. In the whole of the discussion it will be assumed that the persons under consideration are urban dwellers, are reasonably clothed to meet changes of temperature, and live or work in reasonably heated homes or offices. Perhaps the latter is rather a large assumption in the British Isles.

PROTEIN OR BODY-BUILDING MATERIAL

Practically speaking there is no need to alter the amount of protein in diet to meet temperature changes, though there may be, as will be suggested later, reasons for altering the time of day at which the main protein meal is taken. The tendency of people is to eat less protein in hot weather than in cold. If there is any change in the rate of body building it is in the opposite direction. Some children grow more in summer than at other times (Corry Mann, 1926) whereas others put on weight in the autumn (Friend, 1935). Winter is a time of slower growth. Of individual tissues it is known that the finger nails and the hair grow faster in warm weather than in cold, due doubtless to the increased vasodilatation in the skin and region of nail bed.

The indications, such as they are, are for an actual increase

of protein in the hot-weather diet and certainly not for a decrease. It is perhaps best not to make any particular change one way or the other, for the normal protein intake will cover the small extra needs of increased growths rate in summer.

If it is asked if the difference in the specific dynamic action of protein in hot weather and in cold does not indicate the need for a decreased intake of protein in hot weather, the answer is that the specific dynamic action of protein is not related to its use as body builder but to its use in producing calories and so should logically be considered in the next paragraphs, which deal with calories.

ENERGY-PRODUCING MATERIAL

(Fats, carbohydrates and to a smaller extent proteins.)

Do we produce less or more energy in summer than in winter? That depends entirely on the individual and the amount of muscular energy put forth. With the majority of people the longer days and daylight saving usually result in a much greater output of energy in summer than in winter. It is only necessary to picture the average suburban dweller to realize that that is so, and the same may be said of the slum dweller and the worker on the land. Possibly it makes but little difference to the professional man except at week-ends when summer time will increase his output of energy over that of the winter. On the other hand, it is conceivable that there should be people who put out more energy in winter than in summer. The university oarsmen, whose main races are over before summer sets in, may do more muscular work in winter than in summer. The hockey player and the footballer also may, if they are slack in the summer, expend more energy in winter than in summer. Each individual must be considered according to his *curriculum vitæ*. If he takes more exercise in winter than in summer he must eat more in winter than in

summer; if less, less. Fortunately with the majority of people the mechanism is self-adjusting; none the less the lassitude that overtakes some people in the summer may be due to "day-starvation."

What are the facts of heat loss in winter as compared with summer (*a*) as the result of inadequate heating and clothing, (*b*) as the result of the specific dynamic action of protein?

(a) *Heat loss due to temperature of surroundings.*—Most English people would answer that their surroundings are so inadequately heated that they lose much more heat to the surroundings in winter than in summer. Further, the cold of winter stirs them to vigorous muscular energy whereas summer heat relaxes their activities. So for two reasons there may be a deficit of calories in winter owing to the greater difference then between the body temperature and that of the surroundings

But this loss of heat must not be exaggerated. The rate at which the body loses heat to its surroundings does by no means follows the Newtonian law of cooling. It does not lose heat at a rate proportional to the difference in temperature between it and its surroundings. When the thermometer is at 100° F. the body still has to lose heat although on the Newtonian plan it should be gaining heat! In fact, it still loses its 2,500 to 3,000 great calories per day to its environment; and the basal metabolism of the body—the heat it emits per square metre of body surface per hour—does not fall much, if at all, below the normal temperate zone figure when the body is in tropical surroundings.

The utmost that can be said is that if the normal person works or lives much out of doors in the winter, or wears either a thin costume or one that exposes much of the body to the rigours of the climate, he will need more food in winter than in summer. Those who keep themselves warm in winter by

thick clothing (i.e. surround themselves with air at the temperature of the tropics) or by central or other heating, as in the United States, will not need more food in winter than in summer.

That the diet does not need much change in calorie content between winter and summer can be seen from the records made term by term of the calorie intakes of the boys of Christ's Hospital (Friend, 1935). It is quite true that the calorie intake usually, though not always, has its peak in the Lent term, which in Sussex as elsewhere is undoubtedly the coldest. But the intake in calories only increases by some 100 to 300 great calories above the summer figure, and as the average figure taken is 3,000 great calories per day, this is, at the most, but 10 per cent. of the total. People speak of the effect of cold upon the need for food as if it doubled that need, whereas in the 800 and more boys under consideration, it increased it at the most by only 10 per cent. Such a figure in dietetics is almost within the error of experiment.

(b) *Heat loss due to specific dynamic action of food.*—All foods have a specific dynamic action, i.e. they stimulate the body towards wastefulness in the production of heat. Protein is much worse in this respect than other foods. Whereas 4 or 5 per cent. of the energy which carbohydrate and fat are capable of producing is wasted, as much as 30 per cent. of the energy from protein may be squandered and goes to heat up the surroundings. This waste of energy becomes much smaller if the protein is taken in small amounts spread over the day and does not appear at all if the protein is used for body-building or if the body is exposed to cold. Putting it in another way, it would appear at first sight to be disadvantageous to eat much protein in hot weather, for then the body has to get rid of much waste heat into an already heated environment, and more protein can be taken with advantage in cold weather, for its

specific dynamic action can be utilized in keeping up the body temperature.

Protein must be present for body-building purposes in the diet, and in the same, or nearly the same, amount in winter and in summer. Consideration of the effect of hot weather in increasing the specific dynamic action of protein suggests that protein ought to be taken in small amounts at frequent intervals in summer, whereas in winter it does not so much matter. As "little and often" is likely to become the slogan of dietitians, as it is already the practice of the well-to-do, this does not involve much alteration of preconceived ideas. As regards protein in winter, it must be borne in mind that the effect of cold on the specific dynamic action was investigated on animals, which had no protection from their surroundings over and above what Nature gave them. Human beings wear clothes, with the result that the air next the skin has a tropical temperature and consequently there will be an almost identical specific dynamic action of a given amount of protein whether it be consumed in winter or in summer. There seems little reason on this account to make much difference in the protein consumption between winter and summer.

The proportion of heat produced by the specific dynamic action of protein in diet must be small, even when the specific dynamic action is at its greatest. The body evolves about 125 calories per hour. The specific dynamic action of 100 grammes of protein spread over six hours is twenty calories per hour, and consequently the power of dealing with waste heat would have to be increased during that time by 16 per cent. only, which should throw but little strain on the heat regulating mechanism. It need hardly be pointed out that the assumption that 100 grammes of protein is taken all at once is absurdly high. It would correspond to the consumption of 400 grammes, or nearly 1 lb. of grilled steak, an amount

eaten but rarely save by an Australian backwoodsman. So that only if there is great difficulty in getting rid of heat from the body—i.e. the climate is hot *and* humid—need there be attention paid to the specific dynamic action of protein. In the usual summer climate, with cool nights, even if the days be warm, there should be little need to restrict the intake of protein, though it might be well to take at the evening meal the majority of what is taken. Then the specific dynamic action of the meal would not reach its maximum till the small hours of the night.

NEED FOR VITAMINS AND INORGANIC ELEMENTS

Here scepticism as to the need for making a difference between the diet of winter and summer must break down. A good case can be made out for increasing the amounts of vitamins A, C and D, or of the foods which usually contain them, in the winter diet.

In the first place there is less of these vitamins in winter foods. In milk and butter the vitamin A content sinks in winter to half its summer level and does not rise again till the spring grass appears. In winter the vitamin D content of these foods falls to zero (it never is high). Vitamin C is found mainly in summer fruits and not in the fruits which can be stored against the winter (e.g. apples and pears). Besides, storage lowers the amount of C in those fruits and vegetables in which it is found. So that on these counts there is more reason to increase the supply of vitamins in winter.

Next, there is relatively much less sunlight and what there is is of little value in producing vitamin D in our bodies, so that it has to be taken already manufactured. Third, infections of mucous membranes are more common in winter than in summer, and as the protection of these membranes is presided over by vitamin A there are theoretical grounds for increasing its consumption in winter. Disease increases the need for

vitamin C, possibly because of increased difficulty of absorption of it from the alimentary tract, but more likely because it is needed by the tissues. Raised temperature seems to require more vitamin C. It is probable, too, that vitamin B_1 should be raised in amount during illness, possibly because it is not so well absorbed, possibly because more is needed in metabolism. Certainly an increased output of calories demands an increase in vitamin B_1. As illness is more common in winter months an all-round increase of foods containing vitamins is indicated.

Of the inorganic elements little can be said as yet. There are people who should increase their salt (sodium chloride) intake in hot weather to balance the loss of it in perspiration.

To sum up this portion of the article it may be said that, whereas there is no reason to alter the protein intake as between winter and summer, and the intake of calorigenous foods should be determined by the exercise taken and to a less extent by the temperature of the surroundings, there is a case for increasing the intake of vitamins.

PRACTICAL APPLICATION

There is apparently a discrepancy between what the theorist prescribes for diet in winter and summer and what in general people do. This is true more of the town-dweller and of the adult than of the countryman and of the child and adolescent. The public will not normally keep up the calories and protein to the winter level in summer because they have no appetite then for calorigenous foods; and in the winter they do not increase, but rather decrease, the vitamin-containing foods because these are difficult to obtain, expensive to buy and sometimes somewhat unpleasant to the taste (cod-liver oil, halibut-liver oil). It is the task of the dietitian to produce menus which the public will not only take but enjoy and which meet the desiderata of the physiologist and biochemist.

Winter diet.—Taste and inclination lead to a reasonable con-

sumption of protein and calories, and difficulties with vitamins can easily be overcome if attention is paid to the vitamin contents of the various foods given below. So long as 1 pint of milk per day, 2 oz. New Zealand butter, green vegetables or carrots up to 4 oz., and cheese to 1 oz., with liver once a week are taken, the daily ration of vitamin A will be achieved. Even if it is assumed that the fairly high amount of 5,000 international units is needed per day it will be seen from the following table, which gives the amount of vitamin A present in various winter foods, that there need be in an ordinary diet no shortage of it.

TABLE I.*

Vitamin A in international units per 100 grammes (about 3½ oz., or roughly a helping of meat or vegetables).

Canned green beans	600	Butter -	1,540 (436 per oz.)
Cabbage - -	900	Cheese -	5,500 (1,560 per oz.)
Carrot - - -	1,900	Egg yolk	2,300–8,800 (460–1,760 per egg).
Spinach - -	2,630–6,500		
Tomato - -	14,000–35,650	Liver -	3,700–159,800, according to animal, etc.
Milk (stall-fed cows)	340–400 per pint.		

* Mainly from Boas-Fixsen and Roscoe, 1937–1938.

Again with vitamin C there should be no difficulty; 30 mgm. or 600 units are needed per day and the tables of vitamin contents of foods (Boas-Fixsen and Roscoe, 1938) give over twenty different foods in common use which contain from 16 mgm. (320 units) to 220 mgm. (4,400 units) per 100 grammes, or a normal helping. Orange juice (33–89 mgm.) and grape-fruit juice (26–65 mgm.) are the most convenient. Many canned foods, such as black currants, gooseberries, and loganberries, can be used. For the range of foods and the use of canned foods the reader must be referred to Boas-Fixsen and Roscoe (1937–1938) and Olliver (1936, 1938).

With vitamin D there is much more difficulty. There are

practically only four foods which contain appreciable amounts of vitamin D, as will be seen from Table II.

TABLE II

Vitamin D in 100 grammes of different winter foods in International Units.

Butter, Danish	10 (approx.)	Herring	1,000–2,000
English	10–30	Salmon (canned)	200–800
New Zealand	30	Sardine	2,000
Egg yolk	150–500 (i.e. 30–100 per egg)		

Unless fish-liver oils are used there is great difficulty in obtaining the 300 units which may be essential per day. A person will soon tire of herrings, salmon and sardines, and butter and eggs contain such small amounts, and milk has a practically negligible amount. A solution of the problem which is being worked out is that of using one of the fish-liver oils in hors d'œuvres, sauces, mayonnaises, and savouries. (Lindsay and Mottram, 1939).

Summer diet.—The difficulty of keeping up the calories and the protein in summer diet is easily solved if foods, particularly the meat, the fish and the butter, are served cold, and the fruits, used either raw or stewed or as a fruit salad, are well sugared and served with cream.

Appended are two diet sheets, worked out by Miss Grant of King's College of Household and Social Science. The winter diet has a high vitamin-content; the summer diet has the same calorie, protein, fat and carbohydrate value as the winter diet. It is not suggested that these diets should be used as a hard and fast rule and applied to everybody; they are sketches of the means of keeping the vitamins up in winter and the calories up in summer.

HIGH VITAMIN WINTER DIET

Carbohydrate 400, Protein 98, Fat 112. Calories 3,000

BREAKFAST. Stewed dried apricots (4 oz.).
Corn flakes ($\frac{1}{2}$ oz.).
2 eggs—scrambled.

	Wholemeal bread (3 oz.).
	Butter (¾ oz.—some for eggs).
	Marmalade (¼ oz.).
	Sugar (1 oz.—some for cooking fruit).
	Milk (4 oz.—with cereal and with tea or coffee).
	Tea or coffee.
11 A.M.	Cup of marmite.
DINNER.	Meat—average fat (2½ oz.).
	Spinach (3½ oz.), carrots (1½ oz.), potato (3½ oz.).
	Orange, Apple, Banana (2 oz. each, making fresh fruit salad).
	2 small biscuits (1 oz.).
	Butter (½ oz.—some with vegetable).
	Cheese (½ oz.).
	Sugar (½ oz.—with fruit salad and/or coffee).
TEA.	Wholemeal bread (2 oz.).
	Butter (½ oz.).
	Jam (¼ oz.).
	Sugar (½ oz.).
	Milk (1 oz.).
	Tea.
	Cake (1 oz.).
SUPPER.	Soused herring (2½ oz.).
	Tomatoes (3½ oz.).
	Wholewheat bread (3 oz.).
	Butter (½ oz.).
	Jam (¼ oz.).
	Figs or other dried fruit (3 oz.).
	Milk (½ pint).

SUMMER DIET

Carbohydrate 390, Protein 99, Fat 117. Calories 3,002

BREAKFAST.	Stewed prunes (4 oz.).
	Cereal (½ oz.).
	Cold boiled ham (1½ oz.).
	Tomatoes (4 oz.).
	Bread (3 oz.).
	Butter (¼ oz.).
	Marmalade (¼ oz.).
	Sugar (½ oz.).
	Milk (4 oz.—some with cereal and some with tea or coffee).
	Tea or coffee.
11 A.M.	2d. ice-cream.

DINNER	Meat—average fat ($2\frac{1}{2}$ oz.), cold.
	Salad (5 oz.), dressing including 1 teaspoonful oil.
	Potato (2 oz.).
	Bread (1 oz.).
	Stewed apple (4 oz.).
	Junket (5 oz.).
	Sugar (1 oz.—some for cooking fruit).
	2 small biscuits (1 oz.).
	Butter ($\frac{1}{4}$ oz.).
	Cheese ($\frac{1}{2}$ oz.).
	Lemonade (1 oz. lemon juice—sugar from 1 oz. above).
TEA.	Bread (2 oz.).
	Butter ($\frac{1}{3}$ oz.).
	Jam ($\frac{1}{4}$ oz.).
	Cake (1 oz.).
	Sugar ($\frac{1}{2}$ oz.).
	Milk (1 oz.).
	Tea.
SUPPER.	Egg *au gratin* (1 egg and $\frac{1}{2}$ oz. cheese).
	3 oz. bread.
	Butter ($\frac{1}{2}$ oz.—some for cooking).
	Jam ($\frac{1}{2}$ oz.).
	Banana (4 oz.).
	Sugar ($\frac{1}{4}$ oz.).
	1 biscuit ($\frac{1}{2}$ oz.).
	$\frac{1}{2}$ pint milk.
DRINK.	If the weather be at all hot, water should be drunk freely at and between meals. Should there be muscular cramp as the result of exercise the food should be freely salted, or slightly-salted water drunk.

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CHAPTER XXVIII

THE EFFECT OF COOKING ON FOOD

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AND

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THE effect of cooking varies so much with the nature of the food that animal and plant foods will be treated separately. Losses of vitamins, however, will be dealt with all together on pages 347–348.

MEAT AND FISH

(See especially McCance and Shipp, 1933).

There are a few general effects of heat which occur whatever method of cookery is used. As soon as the temperature reaches about 50° C., the proteins begin to coagulate and, at a slightly higher temperature (about 63° C.), the coagulated mass of protein shrinks and squeezes out juice which contains mineral salts, extractives, and a little protein. This is true of all kinds of meat, including offal, and fish, except that fish-roes (like hens' eggs) do not shrink after coagulation. Collagen, an insoluble protein present in the connective tissue, neither coagulates nor shrinks, but it is gradually changed by heat into the soluble protein, gelatin. Another effect of heat is that the fat which is present in meat (even lean meat contains a certain amount of fat) and in fatty fish, such as herring, and salmon, melts and tends to drip away from the flesh.

It is convenient when considering actual methods of cookery to take steaming first, because here the changes due to shrinkage can be seen most clearly. With boiling or stewing, there is diffusion as well as shrinkage; and with roasting and frying, the intense heat leads to increased evaporation of water, and the effect of shrinkage is somewhat altered. With steaming, however, there is shrinkage pure and simple. This involves a slight loss of protein, and a considerable loss of extractives, mineral elements, and water. Since the cooking water is usually thrown away when fish is steamed, there is a real loss of nutriment; meat, however, is rarely steamed and, when it is, the cooking water is generally kept for soup or gravy. The extent of shrinkage is greater with meat than with fish; beef may lose 50 per cent. of its salts during steaming and kidney more than this; and even with fish there may be a loss of about 7 per cent. of the protein nitrogen, and 25-30 per cent. of the freely-soluble mineral elements. This disposes of the popular belief that steaming is a "conservative" method of cookery, involving practically no loss.

An analysis of the juices expressed during steaming shows that the most freely-soluble mineral elements (sodium, potassium and chlorine) suffer the greatest percentage loss, protein suffers the least, whereas calcium, magnesium, iron, and purines occupy an intermediate position. This is what would be expected, since the calcium, magnesium, and iron are partly in combination with proteins, and the purines are partly present in a very insoluable form in the cell nuclei. Small pieces of material shrink more rapidly than large pieces, because they warm up more quickly, but, when shrinkage is complete, the percentage losses of the various constituents are the same, whether the meat or fish is in small pieces or in large ones. With pressure-cooking in steam at 120° C., the losses owing to shrinkage are greater than with ordinary steaming at 100° C.

When meat or fish is boiled or stewed, it shrinks exactly as it does during steaming, but here there is also another source of loss—the diffusion of soluble substances from the flesh into the surrounding water. Meat, however, shows the same percentage loss of weight when it is cooked in water as in steam, because the extra salts lost by diffusion make a negligible difference to the loss in weight. Curiously enough, when fish is boiled, there is a smaller percentage loss in weight than when it is steamed; this is because fish-muscle is of loose texture and tends to take up water when it is immersed in water. The loss of mineral elements, during boiling or stewing, is greater with meat than with fish, but fish may lose nearly half, and meat as much as 60-70 per cent., of its freely-soluble constituents.

With roasting, there is a great increase in the loss of weight, but most of this is a loss of water by evaporation. Shrinkage occurs, it is true, but the protein and mineral elements in the expressed juice are largely left behind on the surface of the flesh, while the water evaporates away. The losses of protein and mineral elements are therefore far less with roasting than with boiling or steaming (see fig. 1). If a closed roasting tin is used instead of an open one, the flesh cooks more quickly, and loses less water (by evaporation) but more of its mineral elements.

Frying in deep fat leads to even more rapid evaporation of water than does roasting, and therefore the loss of protein and mineral elements is reduced to a minimum. Frying must therefore be regarded as the most "conservative" method of cooking. There is, of course, an uptake of fat by both fish and meat when they are fried in fat, and there may be also an uptake of carbohydrate if a "coating" (such as batter or egg and breadcrumbs) is used.

CEREALS

When cereals are boiled in water, the digestibility of the starch

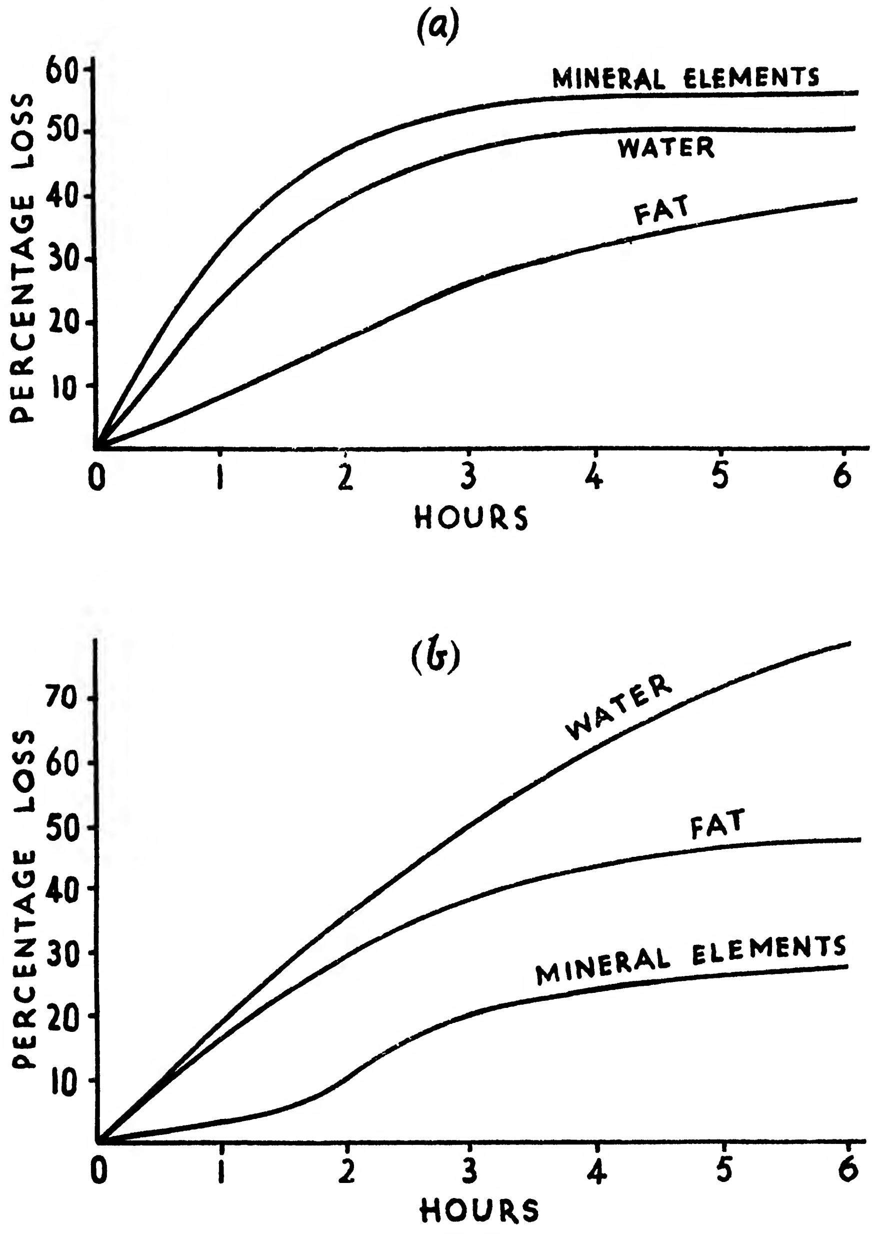

FIG. 1.—Percentage losses of fat, mineral elements, and water from joints of beef (3½ lb.) during (*a*) boiling and (*b*) roasting.

(*After Charts in Medical Research Council, Special Report Series No* 187).

is much increased. In uncooked cereals and cereal products, the starch is present in the form of minute granules, which are not readily digested. As cooking proceeds, however, the starch takes up water and swells, and the starch grains stretch and become easier to digest. The effect of dry heat (as seen in the crust of bread and in toast) is to change some of the starch into dextrin.

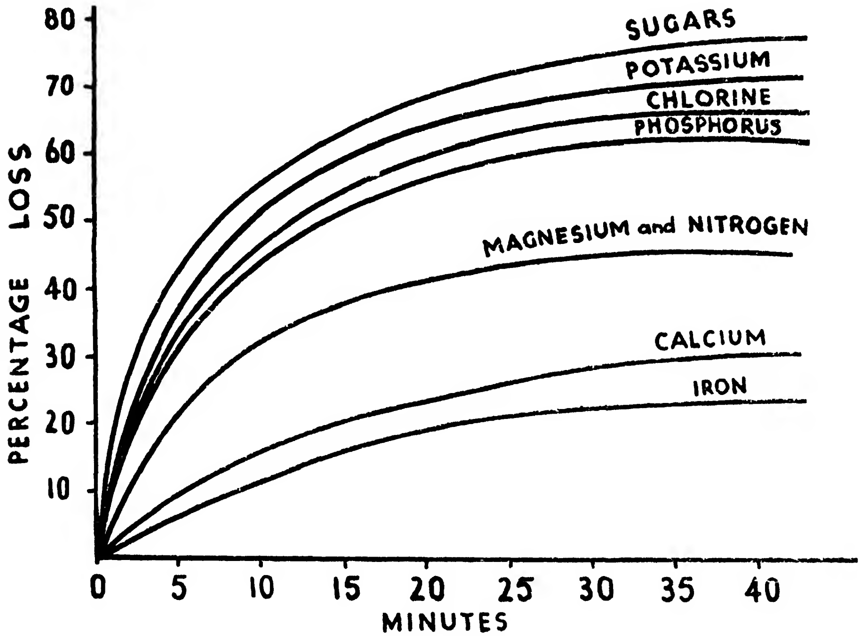

FIG. 2.—The losses of some constituents on boiling scarlet runner beans. (*After Chart in Medical Research Council, Special Report Series No.* 213).

VEGETABLES

(See especially McCance, Widdowson and Shackleton, 1936).

When fresh vegetables are soaked in cold water, there is practically no loss of nutriment material, but with dried peas, haricot beans, and lentils, there may be a loss of 5 to 20 per cent. of the more soluble constituents.

When vegetables are cooked, the fibrous cell-walls are softened, and in starchy vegetables (as in cereals) the starch becomes easier to digest. Some vegetables (carrots, swedes, mushrooms, and spinach) show a certain amount of shrinkage during steaming, but the losses here are not as great as with meat or fish, and such shrinkage as does occur is not due to the protein content of the vegetables. Potatoes show practically no loss when they are steamed.

If vegetables are boiled in water there is a loss of soluble substances by diffusion, and this loss is greater, the smaller the pieces into which the vegetables are cut; for instance, sliced scarlet runner-beans lose far more salts per pound than do carrots cut in large chunks. As might be expected, the freely-soluble mineral elements (sodium, potassium, and chlorine) and sugars show greater percentage losses than the calcium, magnesium and iron (see fig. 2). In spite of the losses by diffusion, however, the waste incurred by throwing away the water in which vegetables have been boiled is not very serious. Even if the so-called "conservative" method of cooking (with practically no added water) is used, the calcium, phosphorus, and iron in a mixed diet are not likely to be increased by more than 3 per cent. When potatoes are boiled in their skins there is no loss at all. With the exception of potatoes with skins intact, vegetables cooked in water containing salt take up salt, and vegetables fried in fat take up fat. Frying leads to a loss of water by evaporation but practically no loss of mineral elements.

FRUIT

(See especially McCance, Widdowson and Shackleton, 1936). When fruit is stewed in water and sugar, some of the sugar diffuses into the fruit, and some of the soluble substances from

the fruit diffuse into the liquid. But, since fruit and syrup are eaten together, these changes have no practical importance. With dried fruits, soaking may be a source of loss, for the soluble constituents (mineral elements and sugars) diffuse out readily, and as much as 40-50 per cent. of them may be lost. If the fruit is cooked in the water used for soaking, however, there will be no real loss.

In jam and marmalade the final product contains all the non-volatile constituents of the original fruit, except for the vitamins; the added sugar is to some extent converted into invert sugar by the prolonged boiling in acid medium.

VITAMINS

(See especially Boas Fixsen, 1938).

There are two causes of loss of vitamins during cooking. In the first place they may diffuse out into the cooking water, and secondly, they may be destroyed by heat.

Vitamin A.—Both vitamin A itself and pro-vitamin A (carotene) are insoluble in water, and are not much affected by ordinary methods of cooking. Carrots, runner-beans, cabbage and dried apricots contain as much carotene when boiled as when raw, and foods of animal origin (such as liver and eggs) do not lose much of their vitamin A when they are cooked. There is no loss of vitamin A or of carotene when milk is pasteurized, or boiled for a short time, and there is some evidence that butter is also unaffected by cooking. In canning, there is probably even less destruction of vitamin A than there is in household cookery.

Vitamin B_1.—Since vitamin B_1 is soluble in water, a good deal of it diffuses out of food during boiling; there is thus a loss if the cooking water is thrown away, as often happens when vegetables are boiled. There is little or no destruction of

this vitamin in boiling water alone or with salt, but, if soda is added, a considerable amount of destruction takes place. At temperatures above 100° C., vitamin B_1 tends to be destroyed, and therefore heavy losses are likely to occur when foods are roasted, fried, or canned.

Vitamin C is often lost in cooking, because it is destroyed by heat in the presence of oxygen. The high temperatures used in frying and roasting are particularly destructive, and even a temperature of 100° C. may destroy a good deal of the vitamin C. At a given temperature, the longer the period of cooking, the more destruction there is; for this reason, slow stewing leads to a greater loss than does rapid boiling, and very slow methods of cookery, such as hay-box cookery, are likely to cause complete destruction of the vitamin C. Since this vitamin is soluble in water there is a further loss when vegetables are boiled if the cooking water is thrown away. With fruits, this extra loss is generally avoided since the cooking water is not wasted; moreover, fruits lose considerably less vitamin C by heat-destruction than vegetables do. The canning of both fruits and vegetables is often less destructive of vitamin C than is household cookery because, during canning, the heating is done in the absence of air, and this minimizes the loss of the vitamin.

Vitamin D is very resistant to heat, and it is therefore unlikely that any destruction occurs either during cooking or canning.

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INDEX